Key to the
Delaware Estuary
Ecological Systems
& Natural Communities

NatureServe

June 2006

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COVER PHOTOS:
Top L: Eastern Hemlock - Great Laurel Swamp, photo from Pennsylvania Natural Heritage
Top R: Pitch Pine - Oak Forest, photo by Andrew Windisch, photo from New Jersey Natural Heritage
Bottom R: Maritime Red Cedar Woodland, photo by Robert Coxe, photo from Delaware Natural Heritage
Bottom L: Water Willow Rocky Bar and Shore in Pennsylvania, photo from Pennsylvania Natural Heritage
KEY TO THE DELAWARE ESTUARY
ECOLOGICAL SYSTEMS
& NATURAL COMMUNITIES

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Sue Gawler
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NatureServe
A nonprofit conserving science within conservation

PARTNERSHIP FOR THE DELAWARE ESTUARY, INC.
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INTRODUCTION

This document was produced to aid land managers in their efforts to identify and map vegetation types using a standard classification system. This system, the National Vegetation Classification (NVC), is managed and refined by NatureServe. It was developed in collaboration with a network of ecologists from Natural Heritage programs across the country, as well as scientists in The Nature Conservancy, federal agencies and academia. The NVC provides a common language that ensures that vegetation types (associations) that are the same but occur across jurisdictional lines (counties, states, refuges, or other political boundaries) are recognized, named and described as the same entities.

For example, swamps dominated by Atlantic white cedar are known variously as “Southern New England basin swamp”, “cedar swamp”, “Chamaecyparis thyoides / Vaccinium corymbosum community”, “white cedar swamp forest” and other names in the literature. In some cases the description is confined to a single site, or it may encompass all cedar swamps of the Atlantic coast; it may include swamps with admixtures of deciduous trees, or an entire wetland complex. All of these descriptions are legitimate types, but they are not comparable beyond the studies in question. The NVC defines an association with a scientific name of “Chamaecyparis thyoides / Ilex glabra - Rhododendron viscosum Forest” and a common name of “Coastal Plain Atlantic White-cedar Swamp”, which is applied to Chamaecyparis thyoides (Atlantic white cedar) - dominated vegetation of the coastal region from Massachusetts to New Jersey. It does not include portions of the wetland that are dominated by red maple, nor does it include white cedar-dominated vegetation of Delaware, Maryland or Virginia, or cedar swamps of more inland regions. Those vegetation types are separately defined and named associations in the NVC. The NVC also cross-references commonly used names for similar vegetation, and provides a measure of how rare or common the type is across its known range.

This document is a key to the subset of Ecological Systems and NVC Associations occurring in the Delaware Estuary watershed, which includes portions of southeastern Pennsylvania, southern New Jersey, and the northeastern shore of Delaware. The Delaware Estuary occurs across four ecoregions: the Central Appalachian Forest, the Lower New England/Northern Piedmont, the North Atlantic Coast, and the Chesapeake Bay Lowlands (Figure 1.). Eco-regions represent geographically distinct assemblages of vegetation types that have similar ecological dynamics, comparable environmental conditions and share many of the same

![Figure 1.](image-url)
species. Although we have attempted to describe all possible vegetation types occurring in the watershed area, not all stands easily fit into the keys. Studies and inventories have not been made of every piece of land. Human impacts on the landscape have imposed changes on vegetation that are not always easy to discern. The very act of classification imposes an artificial boundary on a natural continuum. Still, it is possible, as well as desirable, to be able to recognize and describe discrete types and to make reasonable judgments about how to protect, monitor, and manage these types. We encourage users to provide feedback that will enable us to continue to refine the information in the NVC.

METHODS
The keys were developed by first separating the long list of types into groups of vegetation that would likely be considered together in a key such as upland woody vegetation, wetland forests, wetland shrublands, open upland vegetation, herbaceous wetlands, successional vegetation, and other similar groupings. A type that may reasonably be thought of as occurring in two (or even more) groups was included in each appropriate group. We attempted to use the most obvious and easily observable characteristics of the type in the key, and we used not just plants but also environmental setting and other habitat characteristics that could aid the user in identifying the type.

HOW TO USE THE KEYS
These are dichotomous keys, with numbered couplets. Each couplet (designated by a boxed number above it) has two statements to choose from. Start with the Ecological Systems key. Begin with couplet 1, and decide which statement best applies to your setting, and proceed to the numbered couplet indicated after that statement. Continue along and you will eventually arrive at the ecological system that should fit your setting. If it is unclear which choice is better, make a note and try both directions from that couplet.

After identifying the Ecological System, go to the National Vegetation Classification Associations key. Find the Ecological System in the table of contents and turn to that page in the key. Use the same method to determine which natural community you are in. When you get through the key to a type, refer to the full description in the Guide to the Natural Communities of the Delaware Estuary to confirm if it is the correct type you see in the landscape.

It may be possible to reach the same vegetation type at different points in the key. This is by design. Vegetation types are inherently variable, and at their extremes may look quite different.

A common name and a NatureServe biological conservation database code (CES or CEGL) for each system and association, are listed in bold type in the keys. The common names match the common names in the Guide. The number allows NatureServe to track data on ecological systems and natural communities within the National Vegetation Classification System.

What if the key doesn’t work? There are several possible reasons:

- The type you are looking at may not be typical of the area and is not included in the list of types for the Delaware Estuary Watershed.
- You may be trying to type a transition zone. The classification is designed to impose clear conceptual boundaries on types that grade into each other in reality. Although these transition zones or ecotones are important, they are not classified as separate units unless they are broad, repeat on the landscape,
and have a unique species composition. Before using the key, make sure you have done a
reconnaissance in the area to be sure you are in a portion of the stand that is truly representative.

- You may be applying the key to vegetation at a scale that is different from that used to develop the
classification. For example, a stand of trees must be at least a few acres in extent to be a forest. It is
possible to identify a forest type from stands smaller than that, but often there is so much “edge” that its
identity is very difficult to discern. Conversely, many herbaceous communities occur naturally in
patches less than 0.5 acre in size. Other communities, such as shrub zones along rivers or lakes are
linear in form – not very wide, but quite long. It is important to be cognizant of the average patch size of
vegetation when applying the key.

- The current description does not accommodate the variation you are observing.

- There may be no type describing this stand as yet. This is particularly true of vegetation that has been
recently altered by human activity.

For those stands that do not fit into the classification, please submit a written description of the community
and send it by email to lesley_sneddon@natureserve.org or by mail to the NatureServe office in Boston at
11 Avenue de Lafayette, 5th floor, Boston, MA 02111, or contact the Delaware, New Jersey, or
Pennsylvania Natural Heritage program ecologist.
ECOLOGICAL SYSTEMS KEY

1. Systems occur typically in the Coastal Plain Ecoregion and occasionally in the Chesapeake Bay Lowlands Ecoregion, primarily in southern New Jersey and Delaware ................................................................. 2
   Systems occur in the Piedmont and/or Central Appalachian Ecoregions, primarily in Pennsylvania ........... 24

COASTAL PLAIN ECOLOGICAL SYSTEMS

2. Systems dominated by herbaceous vegetation or mixed herb/shrub vegetation, or sparse vegetation ....... 3
   Systems dominated by woody vegetation, usually with trees; woodlands and forests................................. 12

Non-Forested Systems

3. Primarily upland ........................................................................................................................................ 4
   Primarily wetland or aquatic ...................................................................................................................... 5

4. Sparse vegetation present, beaches ........................................................................................................... 
   Northern Atlantic Coastal Plain Sandy Beach (CES203.301)
   Graminoid/shrub vegetation, not sparse ...................................................................................................... 
   Northern Atlantic Coastal Plain Dune and Maritime Grassland (CES203.264)

5. Salt water or tidally influenced systems such as salt marshes, seagrass beds, shrub swamps, etc.......... 6
   Fresh water or non-tidally influenced systems such as freshwater marshes, pondshores, etc ............... 11

6. Subtidal ....................................................................................................................................................... 7
   Intertidal or near-tidal ................................................................................................................................. 8

7. Seagrass beds dominated by ditch grass .................................................................................................. 
   Northern Atlantic Coastal Plain Seagrass Bed (CES203.246)
   Eelgrass not characteristic, typical species include pondweeds (Potamogeton spp.) and others; brackish to freshwater ..........................................................................................................................................
   Northern Atlantic Coastal Plain Subtidal Aquatic Bed (CES203.521)
### Key to the Ecological Systems in the Delaware Estuary

<table>
<thead>
<tr>
<th>Key</th>
<th>Description</th>
<th>System Name</th>
<th>Code</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>8</strong></td>
<td>Salt marshes, occurring along the coast with minimal freshwater influence</td>
<td>Northern Atlantic Coastal Plain Tidal Saltmarsh</td>
<td>CES203.519</td>
</tr>
<tr>
<td><strong>9</strong></td>
<td>Tidally flooded shrublands along upper tidal reaches of estuaries</td>
<td>Northern Atlantic Coastal Plain Tidal Swamp</td>
<td>CES203.582</td>
</tr>
<tr>
<td><strong>10</strong></td>
<td>Brackish marshes on the outer reaches of tidal rivers</td>
<td>Northern Atlantic Coastal Plain Brackish Tidal Marsh</td>
<td>CES203.894</td>
</tr>
<tr>
<td><strong>11</strong></td>
<td>Emergent and/or submergent marshes with vegetation that does not persist through the winter</td>
<td>Laurentian-Acadian Freshwater Marsh</td>
<td>CES201.594</td>
</tr>
</tbody>
</table>

**Forested Systems**

<table>
<thead>
<tr>
<th>Key</th>
<th>Description</th>
<th>System Name</th>
<th>Code</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>12</strong></td>
<td>Primarily wetland</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>13</strong></td>
<td>Primarily upland</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>14</strong></td>
<td>River and stream processes are prominent: riparian and floodplain systems</td>
<td>Northern Atlantic Coastal Plain Tidal Swamp</td>
<td>CES203.582</td>
</tr>
<tr>
<td><strong>15</strong></td>
<td>Moving-water forces less important: basin wetlands, flatwoods, and peatlands</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Pondshores developing in shallow, sandy-bottomed basins on the coastal plain, often with vegetation in concentric bands, reflecting the fluctuating water levels through the growing season, and generally with coastal plain species such as meadow beauty (Rhexia virginica), golden hedge hysopp (Gratiola aurea), slender goldentop (Euthamia caroliniana), threadleaf sundew (Drosera filiformis), Plymouth rose gentian (Sabatia kennedyana), and others...**

**Northern Atlantic Coastal Plain Pondshore** CES203.518
15 Typically found in the Piedmont and Central Appalachian Ecoregions, large river floodplains

Central Appalachian Floodplain (CES202.608)

Coastal Plain streams and rivers

16 Blackwater streams and rivers, developing in areas with primarily sandy soils

Atlantic Coastal Plain Blackwater Stream Floodplain Forest (CES203.247)

Brownwater streams and rivers, characteristic of areas with more clay-based soils, and carrying large amounts of suspended silt and clay

17 Streams of small watersheds with irregular flooding and with vegetation more uniform

Atlantic Coastal Plain Brownwater Stream Floodplain Forest (CES203.248)

Larger watershed rivers, depositional landforms more well developed and vegetation better segregated by landform

18 Primarily forested swamps (basin or seepage), though may have shrubby openings

Atlantic Coastal Plain Northern Bog (CES203.893)

19 Saturated conifer or mixed swamps, Atlantic white cedar or pitch pine characteristic

Atlantic Coastal Plain Northern Basin Swamp and Wet Hardwood Forest (CES203.520)

20 Peat-based swamps with Atlantic white cedar characteristic and often dominant, red maple often common, especially after logging

Northern Atlantic Coastal Plain Basin Peat Swamp (CES203.522)

Extensive pitch pine dominated wetlands, or patchy wetlands among pitch pine uplands, in the New Jersey Pine Barrens

Northern Atlantic Coastal Plain Pitch Pine Lowland (CES203.374)

21 Maritime forests and shrublands exposed to salt spray, high winds, and occasional overwash

Northern Atlantic Coastal Plain Maritime Forest (CES203.302)
Not maritime, although may be near the coast ................................................................. 22

22

Barrens and woodlands: forest patches may be present with pitch pine (*Pinus rigida*) characteristic, but the overall character is not consistently closed ..........................................................Northern Atlantic Coastal Plain Pitch Pine Barrens (CES203.269)

Primarily forested, with a closed canopy (may have occasional openings) .......................... 23

23

American beech (*Fagus grandifolia*) prominent along with oaks (*Quercus* spp.), mesic sites .......Atlantic Coastal Plain Mesic Hardwood and Mixed Forest (CES203.242)

American beech not as prominent, oaks dominant, occur on acidic, dry sandy to gravelly soils with a thick duff layer, often with an ericaceous shrub layer Northern Atlantic Coastal Plain Dry Hardwood Forest (CES203.475)

PIEDMONT & CENTRAL APPALACHIAN ECOCLOGICAL SYSTEMS

24

Systems dominated by herbaceous vegetation or herb/shrub vegetation, or sparse vegetation .......... 25

Systems dominated by woody vegetation, usually with trees .................................................. 29

Non-forested Systems

25

Primarily upland, including sparse to patchy vegetation and cliffs ......................................... 26

Primarily wetland .................................................................................................................. 27

26

Acidic substrates, eastern red cedar (*Juniperus virginiana*) characteristic .........................North-Central Appalachian Acidic Cliff and Talus (CES202.601)

Substrates with a stronger circumneutral to calcareous influence, ash (*Fraxinus* spp.) and American basswood (*Tilia americana*) or other higher-pH indicators generally present.................................North-Central Appalachian Circumneutral Cliff and Talus (CES202.603)

27

Seepage wetlands on gentle to more extreme slopes, generally at lower elevations and usually with mixed shrub-herb vegetation; *Dasiphora fruticosa* ssp. *floribunda* (shrubby cinquefoil), *Cornus racemosa* (gray dogwood), *Betula pumila* (swamp birch) are characteristic shrubs ........................................ North-Central Appalachian Seepage Fen (CES202.607)

Wetlands in closed or open basins, generally flat ................................................................ 28
Emergent and/or submersent marshes with vegetation that does not persist through the winter......................

Laurentian-Acadian Freshwater Marsh  (CES201.594)

Marshes with persistent emergent vegetation that remain saturated (or with standing water) during the whole growing season.................................................................

Laurentian-Acadian Wet Meadow – Shrub Swamp  (CES201.582)

Forested Systems

Primarily upland systems ...................................................................................................................................... 30
Primarily wetland systems .................................................................................................................................... 39

Primarily forested, with a closed canopy (may have occasional openings) ............................................................. 31
Sparse vegetation, cliffs, slopes, barrens and woodlands: forest patches may be present, but the overall character is not consistently closed canopy................................................................. 36

Mixed pine-deciduous forests .............................................................................................................................. 32
Deciduous forests, or occasionally mixed deciduous-hemlock forests ................................................................ 32

Pitch pine (*Pinus rigida*) dominant and/or occasionally Virginia pine (*Pinus virginiana*) dominated patches;
conifer-dominated patches usually within a matrix of a mixed oak-pine woodland on exposed ridges,
rocky slopes, or sparsely wooded hilltops, a heath shrub layer or graminoid layer may be present........

Central Appalachian Pine – Oak Rocky Woodland  (CES202.600)
Chestnut oak (*Quercus prinus*) often dominant oak species; forests may be all oak or mixed oak-pine;
some inclusions of pine forest may also be present; heaths shrubs common and often forming a well-
developed shrub layer; ranges from the Piedmont west through the Central Appalachians ecoregions and north to the High Alleghenies ........................................................................................................

Central Appalachian Dry Oak – Pine Forest  (CES202.591)

Hardwood forests at moderate to low elevations, sometimes with hemlock as an associate (>25% cover);
widespread in the central Appalachians and Piedmont..........................................................

Appalachian (Hemlock) - Northern Hardwood Forest  (CES202.593)
Hemlock either not present, or minor canopy component................................................................................. 34

Hardwood forests of protected slopes and coves; tree composition is a species-rich mixture of tulip poplar
(*Liriodendron tulipifera*), American basswood (*Tilia americana var. heterophylla*), cucumber magnolia
(Magnolia acuminata), white ash (Fraxinus americana), black cherry (Prunus serotina), mountain silverbell (Halesia tetraptera), etc.; herbaceous layer also typically has high species richness.

Southern and Central Appalachian Cove Forest (CES202.373)

Oak dominated forests

35

Forests on drier sites, with coarse, well-drained soils; chestnut oak a typical and often dominant oak species; forests may be all oak or mixed oak-pine; some inclusions of pine forest may also be present; heath shrubs common and often forming a well-developed shrub layer; ranges from the Piedmont west through the Central Appalachians ecoregions.

Central Appalachian Dry Oak – Pine Forest (CES202.591)

Forests on somewhat more mesic sites; chestnut oak less important than northern red oak (Quercus rubra), white oak (Q. alba), black oak (Q. velutina), and/or scarlet oak (Q. coccinea); mockernut hickory (Carya alba), shagbark hickory (C. ovata), and/or pignut hickory (C. ovalis) may be common associates; pines rarely prominent except in patches of successional pine forest with eastern white pine (Pinus strobus) and/or Virginia pine; heath shrubs often present, but a well-developed shrub layer is not a general characteristic of the system; extends west to the Western Allegheny Plateau and is atypical in the Piedmont.

Northeastern Interior Dry-Mesic Oak Forest (CES202.592)

Sparse vegetation, occurring on cliffs and slopes

36

Woodland vegetation, terrain generally flat

37

Acidic substrates, eastern red cedar (Juniperus virginiana) characteristic

North-central Appalachian Acidic Cliff and Talus (CES202.601)

Substrates with a stronger circumneutral to calcareous influence, ash (Fraxinus spp.) and American basswood (Tilia americana) or other higher-pH indicators generally present

North-central Appalachian Circumneutral Cliff and Talus (CES202.603)

38

Serpentine rock substrate

Appalachian Serpentine Woodland (CES202.347)

Woodlands on acidic igneous or metamorphic rocks

Central Appalachian Pine – Oak Rocky Woodland (202.600)

39

River and stream processes are prominent: riparian and floodplain systems

40

Moving-water forces less important: basin wetlands, flatwoods, and/or peatlands

41
40
Large river floodplains with bars, levees, oxbows well developed and with regular flooding

Central Appalachian Floodplain (CES202.608)

Streams and small rivers with flooding irregular and of shorter duration; floodplain features limited in extent and/or not well developed

Central Appalachian Riparian (CES202.609)

41
Oaks species are prominent, small-patch wetlands associated with poorly-drained glacial deposits

North-Central Interior Wet Flatwoods (CES202.700)

Hemlock-hardwood or hardwood swamps in acidic settings; eastern hemlock (*Tsuga canadensis*), red maple (*Acer rubrum*), and black gum (*Nyssa sylvatica*) are characteristic

North-Central Appalachian Acidic Swamp (CES202.604)
# National Vegetation Classification Associations Key

## Appalachian (Hemlock)-Northern Hardwood Forest

<table>
<thead>
<tr>
<th>Association</th>
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</tr>
</thead>
<tbody>
<tr>
<td>Red Oak - Northern Hardwood Forest</td>
<td>CEGL006173</td>
</tr>
<tr>
<td>High Allegheny Rich Red Oak - Sugar Maple Forest</td>
<td>CEGL006125</td>
</tr>
<tr>
<td>Hemlock - Beech - Oak Forest</td>
<td>CEGL006088</td>
</tr>
<tr>
<td>Hemlock / White Pine - Red Oak - Mixed Hardwood Forest</td>
<td>CEGL006566</td>
</tr>
<tr>
<td>East-central Hemlock Hardwood Forest</td>
<td>CEGL005043</td>
</tr>
<tr>
<td>Central Appalachian White Pine - Eastern Hemlock Forest</td>
<td>CEGL006019</td>
</tr>
<tr>
<td>White Pine - Hemlock Dry-Mesic Coniferous Forest</td>
<td>CEGL006328</td>
</tr>
<tr>
<td>Golden-saxifrage Forested Seep</td>
<td>CEGL006193</td>
</tr>
<tr>
<td>Red Maple - Black Gum Basin Swamp</td>
<td>CEGL006014</td>
</tr>
<tr>
<td>Central Appalachian Forested Acid Seep</td>
<td>CEGL006132</td>
</tr>
<tr>
<td>Northern Hardwood Forest</td>
<td>CEGL006252</td>
</tr>
<tr>
<td>Red Maple Upland Forest</td>
<td>CEGL006547</td>
</tr>
</tbody>
</table>

1. Vegetation primarily woody (trees or tall shrubs exhibiting tree-like growth dominant; canopy closed to partially open – includes “woodland” class of NVC; also includes upland shrub thickets...

2. Vegetation primarily non-forested; canopy more open; forested seeps; forest generally on slopes with saturated soils from seeps or springs; canopy similar to surrounding upland forest, while shrub, herb, and nonvascular layers more typical of wetlands; surrounded by upland forest...

   **Golden-saxifrage Forested Seep** (CEGL006193)

3. Forests and shrub thickets of uplands (not wetlands)...

4. Forests dominated by conifer trees (evergreen trees >50% cover), deciduous trees < 20-25% of the total canopy cover...

5. Conifer forests with a predominant white pine (*Pinus strobus*) component...

6. Conifer forests dominated by hemlock (*Tsuga canadensis*), white pine not present or minor...

7. White pine dominated forests with hemlock and hardwoods co-dominant in the canopy; conifer trees...
KEY TO THE NATIONAL VEGETATION CLASSIFICATION ASSOCIATIONS IN THE DELAWARE ESTUARY

typically <75% of canopy cover. ................................................................. 6

White pine forests with hemlock as a co-dominant in the canopy; conifer trees >75% of canopy cover; dry to
mesic coniferous forest usually on sloping sites or in sheltered ravines. ......................................................

White Pine – Hemlock Dry-Mesic Coniferous Forest (CEGL006328)

6

White pine-hemlock forest that shares canopy dominance with a variety of oaks and hickories; occurs on
deep, moist to well-drained loams and silt loams on mid-slopes and in coves. Soils may be rocky, and
slopes may be steep. .....................................................................................

Hemlock / White Pine - Red Oak - Mixed Hardwood Forest (CEGL006566)

Dry-mesic white pine - hemlock forest with beech, maples and birches as canopy associates; occurs on
well-drained, nutrient-poor acidic soils in the Central Appalachian Ecoregion. ..............................................

Central Appalachian White Pine - Eastern Hemlock Forest (CEGL006019)

7

Hemlock-hardwood forests ............................................................................................... 8

Mixed hemlock-white pine-hardwood forests ............................................................................. 9

8

The overstory is dominated by hemlock (Tsuga canadensis), sugar maple (Acer saccharum), red maple
(Acer rubrum), and American beech (Fagus grandifolia); rarely does any one of these comprise more
than 50% of the mature trees in a stand; soils are typically acid, silty to sandy loams, with a sandstone
or shale parent material. .....................................................................................

East-Central Hemlock Hardwood Forest (CEGL005043)

The canopy is co-dominat by hemlock (Tsuga canadensis) and American beech (Fagus grandifolia) in
variable proportions depending on soil (site) and disturbance characteristics; drier sites tend to have
more abundant beech and cooler sites tend to have more abundant hemlock; soils are typically
nutrient-poor, well-drained, often stony sandy loams or loamy sands; sites generally drier than other
hemlock forests. .............................................................................................

Hemlock - Beech - Oak Forest (CEGL006088)

9

Hemlock-white pine forest that shares canopy dominance with a variety of oaks and hickories; occurs on
deep, moist to well-drained loams and silt loams on mid-slopes and in coves. Soils may be rocky, and
slopes may be steep. .....................................................................................

Hemlock / White Pine - Red Oak - Mixed Hardwood Forest (CEGL006566)

Dry-mesic hemlock-white pine forest with beech, maples and birches as canopy associates; occurs on
well-drained, nutrient-poor acidic soils. .....................................................................................

Central Appalachian White Pine - Eastern Hemlock Forest (CEGL006019)

10

Canopy is co-dominated by hardwoods and conifers .............................................................. 11
Canopy is dominated by hardwoods, conifers minor or absent…………………………………………………………..13

11  
Hemlock (Tsuga canadensis) and American beech (Fagus grandifolia) are canopy co-dominants; in variable proportions depending on soil (site) and disturbance characteristics; drier sites tend to have more abundant beech and cooler sites tend to have more abundant hemlock; soils are typically nutrient-poor, well-drained, often stony sandy loams or loamy sands; sites generally drier than other hemlock forests……………………………………………………………………………………………………………………………

Hemlock - Beech - Oak Forest (CEGL006088)

Oaks more prominent in canopy………………………………………………………………………………………………12

12  
Canopy composition is a variable mixture of red oak (Quercus rubra) (usually at least 30% of the canopy), American beech (Fagus grandifolia), sugar maple (Acer saccharum), red maple (Acer rubrum), and, in some stands, white pine (Pinus strobus) or eastern hemlock (Tsuga canadensis); ericads and other dwarf shrubs are also nearly absent, a characteristic that distinguishes this association from most other red oak forests in the Northeast…………………………………………………………………………………………………………………

Red Oak - Northern Hardwood Forest (CEGL006173)

Red oak-hickory forest that shares canopy dominance with a hemlock and/or white pine; occurs on deep, moist to well-drained loams and silt loams on mid-slopes and in coves. Soils may be rocky, and slopes may be steep………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………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some stands, white pine (*Pinus strobus*) or eastern hemlock (*Tsuga canadensis*). Ericads and other dwarf shrubs are also nearly absent, a characteristic that distinguishes this association from most other red oak forests in the Northeast………………………………………………………………………………………………

**Red Oak - Northern Hardwood Forest** (CEGL006173)

**16**

Groundwater influenced seep communities that occur on substrates that are saturated for extended periods during the growing season, but rarely have standing water………………………………………………………………………………..17

Saturated swamp community that occupies saturated or seasonally wet basins; dominated by red maple (*Acer rubrum*) and black gum (*Nyssa sylvatica*)………………………………………………………………………………………………

**Red Maple - Black Gum Basin Swamp** (CEGL006014)

**17**

Forested seep with red maple (*Acer rubrum*) and black gum (*Nyssa sylvatica*) characteristic and with associates eastern hemlock (*Tsuga canadensis*) and yellow birch (*Betula alleghaniensis*)………………

**Central Appalachian Forested Acid Seep** (CEGL006132)

Small herbaceous openings in forest generally on slopes with saturated soils from seeps or springs; canopy similar to surrounding upland forest, while shrub, herb, and nonvascular layers more typical of wetlands; golden saxifrage (*Chrysosplenium americanum*) is characteristic……………………………….

**Golden-saxifrage Forested Seep** (CEGL006193)
### APPALACHIAN SERPENTINE WOODLAND

<table>
<thead>
<tr>
<th>Key</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Vegetation primarily woody (trees or tall shrubs exhibiting tree-like growth dominant; canopy closed to partially open – includes “woodland” class of NVC; also includes upland shrub thickets)</td>
</tr>
<tr>
<td>2</td>
<td>Vegetation primarily non-forested; herbaceous</td>
</tr>
<tr>
<td>3</td>
<td>Forests and woodlands dominated by conifer trees (evergreen trees &gt;50% cover), deciduous trees &lt; 20-25% of the total canopy cover</td>
</tr>
<tr>
<td>4</td>
<td>Deciduous or mixed forests and woodlands: deciduous trees &gt; 25% of the total canopy cover</td>
</tr>
<tr>
<td>5</td>
<td>The dominant canopy trees are Virginia pine (<em>Pinus virginiana</em>) and Eastern red cedar (<em>Juniperus virginiana</em>). Sassafras (<em>Sassafras albidum</em>) and red maple (<em>Acer rubrum</em>) also are present but are not abundant in the canopy.</td>
</tr>
</tbody>
</table>

#### Serpentine Red-cedar - Virginia Pine - Catbrier Serpentine Forest

This serpentine woodland/forest is dominated by Virginia pine (*Pinus virginiana*) with a subcanopy of Blackjack oak (*Quercus marilandica*).

#### Virginia Pine Serpentine Forest

Dominant canopy trees include red maple (*Acer rubrum*), Virginia pine (*Pinus virginiana*), pitch pine (*Pinus rigida*), and eastern red cedar (*Juniperus virginiana*). The subcanopy is dominated by red maple.

#### Serpentine Red Maple - Pine Forest

Forest or woodland canopy is dominated by red maple and white oak (*Quercus alba*), as well as other oak species, including southern red oak (*Quercus falcata*), northern red oak (*Quercus rubra*), and black oak (*Quercus velutina*); pines are not present.

#### Serpentine Red Maple - Oak - Catbrier Serpentine Forest

Herbaceous communities of uplands (not wetlands), little bluestem (*Schizachyrium scoparium*) is a dominant grass.

#### Key to the National Vegetation Classification Associations in the Delaware Estuary

- Virginia Pine Serpentine Forest
- Serpentine Emergent Wetland
- Serpentine Red Maple - Oak - Catbrier Serpentine Forest
- Serpentine Red Maple – Pine Forest
- Serpentine Red-cedar - Virginia Pine - Catbrier Serpentine Forest
- Serpentine Indiangrass - Little Bluestem Grassland
- Serpentine Little Bluestem - Prairie Dropseed Grassland

### APPALACHIAN SERPENTINE WOODLAND

<table>
<thead>
<tr>
<th>Association</th>
<th>Code</th>
</tr>
</thead>
<tbody>
<tr>
<td>Virginia Pine Serpentine Forest</td>
<td>CEGL006266</td>
</tr>
<tr>
<td>Serpentine Emergent Wetland</td>
<td>CEGL006316</td>
</tr>
<tr>
<td>Serpentine Red Maple - Oak - Catbrier Serpentine Forest</td>
<td>CEGL006438</td>
</tr>
<tr>
<td>Serpentine Red Maple – Pine Forest</td>
<td>CEGL006439</td>
</tr>
<tr>
<td>Serpentine Red-cedar - Virginia Pine - Catbrier Serpentine Forest</td>
<td>CEGL006440</td>
</tr>
<tr>
<td>Serpentine Indiangrass - Little Bluestem Grassland</td>
<td>CEGL006441</td>
</tr>
<tr>
<td>Serpentine Little Bluestem - Prairie Dropseed Grassland</td>
<td>CEGL006442</td>
</tr>
</tbody>
</table>
Herbaceous communities of wetlands; dominated by tufted hairgrass (*Deschampsia caespitosa*) is a dominant grass..............................................................................................................................................................

**Serpentine Emergent Wetland** (CEGL006316)

6

Dominant species also include Indiangrass (*Sorghastrum nutans*); eastern red cedar (*Juniperus virginiana*) may be present; occurs over shallow (15-25 cm deep) silt loam to clay loam soils on low to mid slopes with a northerly aspect...........................................................................................................................................................................................

**Serpentine Indiangrass - Little Bluestem Grassland** (CEGL006441)

Dominant species also include prairie dropseed (*Sporobolus heterolepis*); it typically occurs on mid to upper slopes on very shallow (0-10 cm deep) stony or gravelly sand or silt loam soils. Exposed bedrock and bare ground are common at some locations...........................................................................................................................................................................................

**Serpentine Little Bluestem - Prairie Dropseed Grassland** (CEGL006442)
KEY TO THE NATIONAL VEGETATION CLASSIFICATION ASSOCIATIONS IN THE DELAWARE ESTUARY

CENTRAL APPALACHIAN DRY OAK-PINE FOREST
CES202.591

- Pitch Pine - Scarlet Oak Low- to Mid-Elevation Ridgetop
  CEGL006557
- Virginia Pine Successional Forest
  CEGL002591
- Central Appalachian Forested Acid Seep
  CEGL006132
- Central Appalachian / Northern Piedmont Low-Elevation Chestnut Oak Forest
  CEGL006299
- Appalachian Low-Elevation Mixed Pine / Hillside Blueberry Forest
  CEGL007119
- Black Locust Successional Forest
  CEGL007279
- Northeastern Modified Successional Forest
  CEGL006599
- Ridgetop Scrub Oak Barrens
  CEGL006121
- White Pine - Oak Forest
  CEGL006293

1.
Forest and woodland communities.................................................................2
Shrubland community, occurring on ridgetops, dominated by scrub oak (Quercus ilicifolia)............
Ridgetop Scrub Oak Barrens (CEGL006121)

2.
Forests and woodlands of uplands.................................................................3
Forests and woodlands of wetlands; acidic deciduous seepage swamp dominated by red maple (Acer
rubrum) and black gum (Nyssa sylvatica)..........................................................
Central Appalachian Forested Acid Seep (CEGL006132)

3.
Forests and woodlands dominated by conifer trees (evergreen trees >50% cover), deciduous trees < 20
25% of the total canopy cover..............................................................................4
Deciduous or mixed forests and woodlands: deciduous trees > 25% of the total canopy cover...........8

4.
Conifer forests dominated by pitch pine (Pinus rigida) and/or Virginia pine (Pinus virginiana)...........5
Conifer forests dominated by white pine (Pinus strobus) with a mixture of oaks (Quercus spp.)..........White Pine - Oak Forest (CEGL006293)

5.
Conifer forests dominated by Virginia pine (Pinus virginiana)..............................................6
Conifer forests dominated by pitch pine (Pinus rigida)........................................................7

6.
Forests strongly dominated by Virginia pine with few other associates; canopy dense, with admixtures of
early successional deciduous trees (e.g., red maple, tulip poplar); occurs in a variety of environmental
settings.................................................................................................................
Virginia Pine Successional Forest (CEGL002591)
Virginia pine forests of greater diversity - mixed with other pines, or with other conifers and hardwoods; blueberries (*Vaccinium* spp.) dominate the shrub layer; occurs on exposed sites with shallow soils……

Appalachian Low-Elevation Mixed Pine / Hillside Blueberry Forest (CEGL007119)

7
Pitch pine (*Pinus rigida*) dominated community occurring on dry, sandy, acidic soils. Pitch pine cover can vary from 25-75%; scarlet oak (*Quercus coccinea*) and blueberries are abundant……………………………………

Pitch Pine - Scarlet Oak Low- to Mid-Elevation Ridgetop (CEGL006557)
Pitch pine –Virginia pine mixed community occurring along narrow ridges and knobs, steep upper slopes, chestnut oak is characteristic…………………………………………………………………………………

Appalachian Low-Elevation Mixed Pine / Hillside Blueberry Forest (CEGL007119)

8
Forests dominated by oaks; oaks make up at least 50% of canopy cover……………………………………9
Forests not dominated by oaks; (oaks may be present but not abundant in the canopy); early successional species including red maple, black cherry (*Prunus serotina*), and black locust (*Robinia pseudoacacia*) are common………………………………………………………………………………………………………10

9
Scarlet oak (*Quercus coccinea*) and pitch pine dominate the canopy; occurs on dry, sandy acidic soils……

Pitch Pine - Scarlet Oak Low- to Mid-Elevation Ridgetop (CEGL006557)
Chestnut oak dominated canopy, pines not present; other canopy associates include a mixture of oak species including scarlet oak, white oak, and black oak; pink azalea (*Rhododendron periclymenoides*) is frequent in the tall-shrub layer, and early lowbush blueberry (*Vaccinium pallidum*) is present and often abundant as a dwarf-shrub, both are diagnostics for this type……………………………………………………………

Central Appalachian / Northern Piedmont Low-Elevation Chestnut Oak Forest (CEGL006299)

10
Canopy is dominated by near monoculture of black locust (*Robinia pseudoacacia*); an early successional forest often associated with the abandonment of old fields…………………………………………………………………………………………

Black Locust Successional Forest (CEGL007279)
Tree species may include black cherry, tulip poplar (*Liriodendron tulipifera*), white ash (*Fraxinus americana*) and red maple; black locust may be present but not dominant; exotic shrubs and vines are abundant; in associated with land clearing……………………………………………………………………………………………………

Northeastern Modified Successional Forest (CEGL006599)
**CENTRAL APPALACHIAN RIPARIAN**

**CES202.609**

- Northeastern Temperate Cobble Scour Rivershore  CEGL006536
- Rocky Bar and Shore (Riverweed Type)  CEGL004331
- Water-willow Rocky Bar and Shore  CEGL004286
- Birch - Willow Riverbank Shrubland  CEGL003896
- Fall-Line Riverwash Bedrock Prairie  CEGL006283
- Coastal Plain Oak Floodplain Swamp  CEGL006605
- Loosestrife - Dogbane Scoured Rivershore  CEGL006554
- Willow River - Bar Shrubland  CEGL006065
- Successional Aspen / Grey Birch Forest  CEGL006560

1. Herbaceous vegetation of high energy river bottoms, or shores influenced by flood scour exposing rock, cobble, or other mineral substrate .................................................................2  
Woody vegetation (trees or shrubs exhibiting tree-like growth dominant; canopy closed to partially open- includes “woodland” and “shrubland” classes of NVC) along side river or streams .........................6

2. Submerged vegetation of higher energy river rapids..........................................................3  
Vegetation not submerged .......................................................................................................5

3. Vegetation clearly dominated by one species, monotypic..................................................4  
No one species dominates, species composition is variable due to constant river scour; fringed loosestrife 
(*Lysimachia ciliata*) and clasping-leaf dogbane (*Apocynum cannabinum*) are characteristic…………..  
**Loosestrife - Dogbane Scoured Rivershore** (CEGL006554)

4. Vegetation dominated by riverweed (*Podostemum ceratophyllum*); community tends to be associated with  
higher pH streams which cut through diabase, limestone or calcareous shales..............................  
**Rocky Bar and Shore (Riverweed Type)** (CEGL004331)  
Vegetation dominated by water-willow (*Justicia americana*); community tends to occur on the heads of islands, along the edges of bars, banks, terraces, and spits, and in shallow sections of the river channel .................................................................  
**Water-willow Rocky Bar and Shore** (CEGL004286)

5. Riverside grasslands dominated by tall prairie grasses such as big bluestem (*Andropogon gerardii*), Indian  
grass (*Sorghastrum nutans*), and little bluestem (*Schizachyrium scoparium*); generally occurring along  
major rivers in flood-scoured areas ......................................................................................

---

24
**Fall-Line Riverwash Bedrock Prairie** (CEGL006283)

Riverside grasslands characterized by twisted sedge (*Carex torta*), generally on cobble, gravel or sand substrates along high-gradient sections of rivers; vegetation may be sparse and the species composition may be fairly diverse stunted, battered shrubs and tree saplings may occur at low cover…

**Northern Temperate Scour Cobble Rivershore** (CEGL006536)

6

Forest or woodland dominated community………………………………………………………………………………………………….7
Shrub dominated community………………………………………………………………………………………………………..8

7

Floodplain swamp community dominated by oaks; occurs in pockets of saturated soils in, or at the edges of, depressions within a larger floodplain forest with annual flooding. ………………………………………

**Coastal Plain Oak Floodplain Swamp** (CEGL006605)

Early successional forest community dominated by aspen (*Populus* spp.) and gray birch (*Betula populifolia* commonly found on former agricultural land, in areas of ice scour along stream banks, and where there has been major disturbance resulting in areas of exposed mineral soil. ………………………………………

**Successional Aspen / Grey Birch Forest** (CEGL006560)

8

River birch (*Betula nigra*) is characteristic and often dominant; subject to relatively frequent and powerful flooding and ice-scour; stunted and often battered trees (less than 5 m tall) are characteristic and can include silver maple (*Acer saccharinum*), sycamore (*Platanus occidentalis*), and box elder (*Acer negundo*)……………………………………………………………………………………………………………………………..

**Birch - Willow Riverbank Shrubland** (CEGL003896)

River birch and twisted sedge are characteristic; community occurs on cobble substrates with sand and gravel in areas that are flooded only during high-water events; occupies an intermediate position along disturbance gradient between open, herbaceous cobble shores and higher floodplain forests……………

**Willow River – Bar Shrubland** (CEGL006065)
KEY TO THE NATIONAL VEGETATION CLASSIFICATION ASSOCIATIONS IN THE DELAWARE ESTUARY

CENTRAL APPALACHIAN PINE-OAK ROCKY WOODLAND
CES202.600

• Pitch Pine Rocky Summit CEGL006116
• Central Appalachian Blueberry Shrubland CEGL003958
• Ridgetop Scrub Oak Barrens CEGL006121
• Little Bluestem - Poverty Grass Low- to Mid-Elevation Outcrop Opening CEGL006544

1
Vegetation primarily woody (trees or tall shrubs exhibiting tree-like growth dominant; canopy closed to
partially open – includes “woodland” class of NVC; also includes upland shrub thickets……………..2

Vegetation non-forested; grassland community dominated by poverty oat grass (Danthonia spicata), little
bluestem (Schizachyrium scoparium) and wavy hairgrass (Deschampsia flexuosa); occurs in openings
on rocky outcrops………………………………………………………………………………………………….

Little Bluestem - Poverty Grass Low- to Mid-Elevation Outcrop Opening (CEGL006544)

2
Shrub dominated vegetation…………………………………………………………………………………………..3

Woodland vegetation dominated by stunted pitch pines (Pinus rigida) on rocky hilltops with exposed
bedrock; lichens are prominent……………………………………………………………………………………………

Pitch Pine Rocky Summit (CEGL006116)

3
Dwarf shrubland, blueberries (Vaccinium spp.) and black huckleberry (Gaylussacia baccata ) are dominant;
scrub oak (Quercus ilicifolia) present but not abundant………………………………………………………………………

Central Appalachian Blueberry Shrubland (CEGL003958)

Variable stature shrubland, scrub oak is dominant………………………………………………………………………………

Ridgetop Scrub Oak Barrens (CEGL006121)
### CENTRAL APPALACHIAN FLOODPLAIN

**CES202.608**

- Northeastern Temperate Cobble Scour Rivershore  CEGL006536
- Floodplain Pool  CEGL007696
- Northeastern Buttonbush Shrub Swamp  CEGL006069
- River Birch Low Floodplain Forest  CEGL006184
- Red Maple - Green Ash Forested Swamp  CEGL006548
- Silver Maple - Elm Forest  CEGL002586
- Coastal Plain Oak Floodplain Swamp  CEGL006605
- Green Ash - Mixed Hardwood Floodplain Forest  CEGL006657
- Mid-Atlantic Terrace Hardwood Floodplain Forest  CEGL006314
- Alluvial Alder Swamp  CEGL006414
- Box-elder Floodplain Forest  CEGL005033
- Water-willow Rocky Bar and Shore  CEGL004286
- Small River Red Maple - Elm Floodplain Forest  CEGL006975

1. Vegetation primarily woody; forest, woodland, shrubland floodplain and swamp communities………………2
2. Vegetation primarily herbaceous or sparse………………………………………………………………………………11

2. Forested communities………………………………………………………………………………………………………3
3. Shrub dominated communities…………………………………………………………………………………………10

3. Floodplain/riparian forests on alluvial soils of low or high terraces of riverbanks…………………………………4
4. Wet forests of basins, saturated slopes, or other lowlands in an alluvial setting……………………………………9

4. Floodplain forest canopy dominated by maples…………………………………………………………………………5
5. Canopy dominants otherwise ……………………………………………………………………………………………7

5. Silver maple (*Acer saccharinum*) or red maple (*Acer rubrum*) dominant………………………………………6

6. Box elder (*Acer negundo*) dominant……………………………………………………………………………………Box-elder Floodplain Forest (CEGL005033)

6. Silver maple typically dominant; forest along major rivers and smaller perennial streams with low shrub cover (<25 % cover), prominent vine cover, and a lush herb layer with false nettle abundant…………………..Silver Maple - Elm Forest (CEGL002586)
Red maple typically dominant in canopy, silver maple may occasionally be dominant; American elm (Ulmus americana) is a canopy associate; sensitive fern (Onclea sensibilis) and false nettle (Boehmeria cylindrica) are characteristic in the herb layer; occurs within lower alluvial terraces, backwaters, bars, and islands of minor rivers and smaller tributaries, creeks and drainages.

**Small River Red Maple - Elm Floodplain Forest** (CEGL006975)

7. Floodplain forest canopy dominated or co-dominated by ash species (Fraxinus spp.)

Ash not present in community; river birch (Betula nigra) and sycamore (Platanus occidentalis) dominate these high-energy river floodplain forests.

**River Birch Low Floodplain Forest** (CEGL006184)

8. Floodplain forests with a mixture of hardwoods in the canopy, but dominated by green ash (Fraxinus pensylvanica), generally with sycamore (Platanus occidentalis) and enrichment indicators such as walnut (Juglans nigra).

**Green Ash - Mixed Hardwood Floodplain Forest** (CEGL006575)

Rich floodplain forests with tulip tree (Liriodendron tulipifera) and an admixture of ash in the canopy; shrub and herb layers generally well developed.

**Mid-Atlantic Terrace Hardwood Floodplain Forest** (CEGL006314)

9. These communities are found on water-deposited clayey or loamy sediments on oxbows or floodplains of rivers and large perennial streams with abundant red maple and green ash; pin oak (Quercus palustris) is not prominent (although present); false nettle is common in the herb layer.

**Red Maple - Green Ash Forested Swamp** (CEGL006548)

Wetland forest of alluvial backswamps; pin oak prominent along with water oak (Quercus phellos), red maple and sweet gum (Liquidambar styraciflua); stout wood reed grass (Cinna arundinacea) is common in the herb layer.

**Coastal Plain Oak Floodplain Swamp** (CEGL006605)

10. Buttonbush (Cephalanthus occidentalis) swamps that experience prolonged or semipermanent flooding for much of the growing season with water tables receding below the soil surface only during drought or very late in the growing season.

**Northeastern Buttonbush Shrub Swamp** (CEGL006069)

Silky dogwood (Cornus amomum) and brook-side alder (Alnus serrulata) dominant; buttonbush is often an associate shrub.

**Alluvial Alder Swamp** (CEGL006414)

11. Herbaceous vegetation of high energy river bottoms, or shores influenced by flood scour exposing rock, cobble, or other mineral substrate.

**Coastal Plain Oak Floodplain Swamp** (CEGL006605)
Herbaceous emergent vegetation associated with pools, ponds and depressions of rivers in which water is ponded for all or much of the year……………………………………………………………………………………………………………………

**Floodplain Pool** (CEGL007696)

12
Riverside grasslands characterized by twisted sedge (*Carex torta*), generally on cobble or gravel or sand substrates along high-gradient sections of rivers; vegetation may be sparse and species composition may be fairly diverse; stunted, battered shrubs and tree saplings may occur at low cover………………

**Northern Temperate ScourCobble Rivershore** (CEGL006536)

Vegetation dominated by water-willow (*Justicia americana*); community tends to occur on the heads of islands, along the edges of bars, banks, terraces, and spits, and in shallow sections of the river channel…………………………………………………………………………………………………………………………………………

**Water-willow Rocky Bar and Shore** (CEGL004286)
LAURENTIAN-ACADIAN FRESHWATER MARSH

• Open Water Marsh with Mixed Submergents/Emergents
• Eastern Reed Marsh
• Eastern Cattail Marsh
• Water-lily Aquatic Wetland
• Northeastern Leafy Forb Marsh
• Bulrush Deepwater Marsh
• Woolgrass Marsh

1
Submerged vegetation; plants aquatic or floating-leaved ................................................................. 2
Emergent marsh vegetation; majority of plants above water (although floating-leaved plants may be a
component).................................................................................................................................................. 3

2
Aquatic vegetation dominated by floating leaved and submerged-leaved macrophytes, especially tapegrass
(Vallisneria americana) and pondweeds (Potamogeton spp.); water lilies (Nymphaea spp.) and pond
lilies (Nuphar spp.) may be present but are not dominant.................................................................
Open Water Marsh with Mixed Submergents / Emergents (CEGL006196)

Aquatic vegetation dominated by white water-lily (Nymphaea odorata) and/or yellow pond-lily (Nuphar
variegata)..................................................................................................................................................
Water-lily Aquatic Wetland (CEGL002386)

3
Freshwater marsh dominated by graminoids (slender-leaved plants, including grasses, sedges, rushes,
cattails, etc.).............................................................................................................................................. 4
Freshwater marsh dominated by broad-leaved emergent herbs........................................................... 7

4
Freshwater marsh dominated by cattails (Typha spp.)..........................................................................
Eastern Cattail Marsh (CEGL006153)

Freshwater marsh not dominated by cattails ........................................................................................ 5

5
Freshwater marsh dominated by eastern reed (Phragmites australis)....................................................
Eastern Reed Marsh (CEGL004141)

Freshwater marsh not dominated by eastern reed .............................................................................. 6

6
Freshwater marsh dominated by bulrushes including hard-stemmed bulrush (Schoenoplectus acutus), soft-
stem bulrush (Schoenoplectus tabernaemontani) and/or three square bulrush (Schoenoplectus americanus)......................................................................................................................

**Bulrush Deepwater Marsh** (CEGL006275)

Freshwater marsh dominated by woolgrass (Scirpus cyperinus) ..........................................................................................................................

**Woolgrass Marsh** (CEGL006349)

7

Emergent wetland dominated by pickerelweed (Pontederia cordata), arrowheads (Sagittaria spp.), and/or arrow-arum (Peltandra virginica) ...........................................................................................................................................

**Northeastern Leafy Forb Marsh** (CEGL006191)

Emergent wetland dominated by white water-lily (Nymphaea odorata) and/or yellow pond-lily (Nuphar variegata) ......................................................................................................................................

**Water-lily Aquatic Wetland** (CEGL002386)
KEY TO THE NATIONAL VEGETATION CLASSIFICATION ASSOCIATIONS IN THE DELAWARE ESTUARY

LAURENTIAN-ACADIAN WET MEADOW-SHRUB SWAMP
CES201.582

- Eastern Reed Marsh CEGL004141
- Seasonally Flooded Mixed Graminoid Meadow CEGL006519
- Dogwood - Willow Swamp CEGL002186
- Bluejoint Wet Meadow CEGL005174
- Woolgrass Marsh CEGL006349
- Reed Canary grass Eastern Marsh CEGL006044
- Speckled Alder Swamp CEGL002381
- Eastern Tussock Sedge Meadow CEGL006412
- Willow River - Bar Shrubland CEGL006065

1
Vegetation primarily woody ........................................................................................................... 2
Vegetation primarily herbaceous .................................................................................................... 5

2
Willows are the dominant shrub species ......................................................................................... 3
Willows not dominant, but may be present ...................................................................................... 4

3
Early successional shrubland of floodplains and river gravel bars and islands; strongly dominated by
Willows (Salix spp.) and lacking river birch (Betula nigra); generally of northern distribution.........
Willow River-Bar Shrubland (CEGL006065)

Shrubland occurs along lakes, streams or in upland depressions; willows and silky dogwood
(Cornus amomum) are dominant; shrubs at least 25% cover, and often very dense (>60% cover);
more open stands may have higher graminoid cover ......................................................................
Dogwood-Willow Swamp (CEGL002186)

4
Taller shrub wetlands dominated by alders (Alnus spp.); additional associates include may dogwoods
(Cornus spp.), willows, or meadowsweets (Spiraea spp.) .................................................................
Speckled Alder Swamp (CEGL002381)

Wet meadow intermixed with up to 50% shrub cover; shrub species typically include narrow-leaved
meadowsweet (Spiraea alba) and willows; other shrub constituents vary from site to site, and may
include alders, buttonbush (Cephalanthus occidentalis), dogwoods, winterberry (Ilex verticillata), and
others; the herbaceous layer is often dominated by bluejoint (Calamagrostis canadensis), woolgrass
(Scirpus spp.) and three-way sedge (Dulichium arundinaceum) ..................................................
Seasonally Flooded Mixed Graminoid Meadow (CEGL006519)
KEY TO THE NATIONAL VEGETATION CLASSIFICATION ASSOCIATIONS IN THE DELAWARE ESTUARY

5
Freshwater marsh frequently or continually inundated with water, dominated by graminoids (slender-leaved plants, including grasses, sedges, rushes)..................................................................................................................................................6

Wet meadows, typically drier than other marshes except during periods of seasonal high water, dominated by graminoids..........................................................................................................................................................8

6
Freshwater marsh dominated by reed canary grass (Phalaris arundinacea)..............................................
Reed Canary Grass Eastern Marsh (CEGL00644)

Freshwater marsh not dominated by reed canarygrass..............................................................................7

7
Freshwater marsh dominated by eastern reed (Phragmites australis).......................................................Eastern Reed Marsh (CEGL004141)

Freshwater marsh dominated by woolgrass (Scirpus cyperinus).................................................................Woolgrass Marsh (CEGL006349)

8
Wet meadow dominated by tussock sedge (Carex stricta)........................................................................Eastern Tussock Sedge Meadow (CEGL006412)

Wet meadow not dominated by tussock sedge............................................................................................9

9
Wet meadow dominated by bluejoint (Calamagrostis canadensis)...............................................................Bluejoint Meadow (CEGL005174)

Diverse wet meadow where the dominant species are variable but can include blue joint (Calamagrostis canadensis), woolgrass (Scirpus spp.) and threeway sedge (Dulichium arundinaceum); shrubs are common, but less than 50% cover ........................................................................................................................................Seasonally Flooded Mixed Graminoid Meadow (CEGL006519)
KEY TO THE NATIONAL VEGETATION CLASSIFICATION ASSOCIATIONS IN THE DELAWARE ESTUARY

NORTH-CENTRAL APPALACHIAN CLIFF AND TALUS
CES202.601

- Chestnut Oak - Black Birch Wooded Talus Slope CEGL006565
- Kittatiny Ridge Sparsely Vegetated Sandstone Cliff CEGL006443

Community on slopes; more densely vegetated; canopy dominated by more-or-less gnarled specimens of black birch \( \textit{Betula lenta} \) and chestnut oak \( \textit{Quercus prinus} \) generally <20 m tall; occurs within weathered boulderfields and slopes covered by coarse to fine, boulders and rocks…………………………

**Chestnut Oak - Black Birch Wooded Talus Slope** (CEGL006565)

Sparse vegetation occurring on vertical to near-vertical sandstone outcrops and cliffs associated with Kittatinny Ridge in Pennsylvania; species composition is variable given limited habitat to support vegetation and unpredictable nature of plant colonization and establishment…………………………

**Kittatiny Ridge Sparsely Vegetated Sandstone Cliff** (CEGL006443)
KEY TO THE NATIONAL VEGETATION CLASSIFICATION ASSOCIATIONS IN THE DELAWARE ESTUARY

NORTH-CENTRAL APPALACHIAN ACIDIC SWAMP
CES202.604

- Red Maple - Black Gum Basin Swamp
- Eastern Hemlock - Great Laurel Swamp
- Southern New England Red Maple Seepage Swamp
- Central Appalachian Forested Acid Seep
- Red Maple - Black Ash Swamp
- Red Maple - Tussock Sedge Wooded Marsh
- Lower New England Red Maple – Black Gum Swamp

1
Forested seeps; forest generally on slopes with saturated soils from groundwater seeps or springs
Saturated swamp or wooded marsh communities that occupy saturated or seasonally wet basins

2
Acidic seeps; not species rich
Species rich seeps, typically occur on calcareous bedrock; enriched red maple-black ash (Acer rubrum-Fraxinus nigra) seepage swamps south of extent of glaciation

Red Maple - Black Ash Swamp Forest (CEGL007441)

3
Red maple and black gum (Nyssa sylvatica) characteristic and with associates eastern hemlock (Tsuga canadensis) and yellow birch (Betula alleghaniensis)

Central Appalachian Forested Acid Seep (CEGL006132)

Red maple swamps receiving considerable groundwater seepage (although not very enriched) as evidenced by significant cover of spicebush (Lindera benzoin), sensitive fern (Onoclea sensibilis), skunk cabbage (Symplocarpus foetidus) and mosses such as Mnium spp. or Calliergon spp.; canopy associates can include yellow birch and ash (Fraxinus spp.)

Southern New England Red Maple Seepage Swamp (CEGL006406)

4
Swamp dominated by eastern hemlock and great laurel (Rhododendron maximum) prominent

Eastern Hemlock - Great Laurel Swamp (CEGL006279)

Saturated swamp or wooded marsh communities dominated by red maple

5
Red maple swamps with dense shrub understories
Red maple swamps characterized by an herbaceous layer strongly dominated by sedges

Red Maple - Tussock Sedge Wooded Marsh (CEGL006119)
6
Red maple swamps receiving considerable groundwater seepage (although not very enriched) as evidenced by significant cover of spicebush, sensitive fern, skunk cabbage and mosses; canopy associates can include yellow birch and ash.......................................................................................................................  
Southern New England Red Maple Seepage Swamp (CEGL006406)

Red maple swamps not receiving considerable groundwater seepage........................................................................7

7
Black gum present in forest canopy........................................................................................................................................8
Enriched red maple-black ash seepage swamps south of extent of glaciation..........................................................  
Red Maple - Black Ash Swamp Forest (CEGL007441)

8
Hardwood forested swamps co-dominated by red maple and black gum, generally occurring in small, isolated basins high in watersheds in the Pennsylvania portion of the watershed; yellow birch, eastern hemlock and white pine (Pinus strobus) may be minor in the canopy, shrub layer usually well-developed; strong hummock and hollow microtopography and dense Sphagnum carpet characteristic..
Red Maple - Black Gum Basin Swamp (CEGL006014)

Red maple basin swamps occurring within the New Jersey portion of the watershed; black gum may be present, but is minor in canopy ........................................................................................................  
Lower New England Red Maple - Black Gum Swamp (CEGL006156)
KEY TO THE NATIONAL VEGETATION CLASSIFICATION ASSOCIATIONS IN THE DELAWARE ESTUARY

NORTH-CENTRAL APPALACHIAN CIRCUMNEUTRAL CLIFF AND TALUS
CES202.603

• Calcareous Slope Forest CEGL006020
• Montane Cliff (Calcereous Type) CEGL004476

1 Community occurs on calcareous cliffs, outcrops, and rocky slopes in southeastern Pennsylvania, and is often shaded by trees rooted in adjacent forested communities and/or the outcrops; it has little vegetative cover, often with 90% of the rock surface unvegetated; maidenhair spleenwort (Asplenium trichomanes) and wild columbine (Aquilegia canadensis) are characteristic.

Montane Cliff (Calcereous Type) (CEGL004476)

Community on slopes; more densely vegetated; enriched, dry-mesic to mesic forest on talus or shallow very rocky soils dominated by sugar maple (Acer saccharum) and white ash (Fraxinus americana) and with many canopy associates; shrub layer is characterized by bladdernut (Staphylea trifolia); herb layer is characterized by bladder ferns (Cystopteris spp.), woodsia ferns (Woodsia spp.), wild ginger (Asarum canadense), and others; tends to have more southern species that drop out at the northern edge of the range.

Calcareous Slope Forest (CEGL006020)
## North-Central Appalachian Seepage Fen

**CES202.607**

<table>
<thead>
<tr>
<th>Key</th>
<th>Association</th>
<th>Code</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Woody plants dominate</td>
<td>CEGL002385</td>
</tr>
<tr>
<td>2</td>
<td>Herbaceous plants dominate</td>
<td>CEGL006357</td>
</tr>
<tr>
<td>3</td>
<td>Intermediate or calcareous fens dominated by tall shrubs such as dogwoods (<em>Cornus</em> spp.) and/or willows (<em>Salix</em> spp.)</td>
<td>CEGL006359</td>
</tr>
<tr>
<td>4</td>
<td>Intermediate or calcareous fens with short shrubs such as northern bayberry (<em>Morella pensylvanica</em>), and/or shrubby cinquefoil (<em>Diasphora fruticosa ssp. floribunda</em>); tall shrubs lacking or sparse</td>
<td>CEGL006103</td>
</tr>
<tr>
<td>5</td>
<td>Shrubby cinquefoil, yellow sedge (<em>Carex flava</em>) and rigid sedge (<em>Carex tetanica</em>) dominant</td>
<td>CEGL006357</td>
</tr>
<tr>
<td>6</td>
<td>Northern bayberry dominant</td>
<td>CEGL006103</td>
</tr>
<tr>
<td>7</td>
<td>Grass or sedge vegetation dominant</td>
<td>CEGL006551</td>
</tr>
<tr>
<td>8</td>
<td>Skunk cabbage (<em>Symplocarpus foetidus</em>) dominated early in growing season and jewelweed (<em>Impatiens capensis</em>) later in season; groundwater emergence often tapering later in season</td>
<td>CEGL002385</td>
</tr>
<tr>
<td>9</td>
<td>Shrubby cinquefoil, yellow sedge, and rigid sedge dominant</td>
<td>CEGL006549</td>
</tr>
<tr>
<td>10</td>
<td>Shrubs not abundant, sedges dominant</td>
<td>CEGL006551</td>
</tr>
<tr>
<td>11</td>
<td>Open sedge-dominated fens that occur on organic soil saturated by base-rich groundwater; dominants typically include prairie sedge (<em>Carex prairea</em>) and tussock sedge (<em>Carex stricta</em>)</td>
<td>CEGL006551</td>
</tr>
</tbody>
</table>
Sedge-dominated peatlands of higher elevations in the Central Appalachians; dominants include hoary sedge (*Carex canescens*), tawny cottongrass (*Eriophorum virginicum*) and beaked sedge (*Carex utriculata*).

**Sedge – Cottongrass Peatland Fen** (CEGL006549)
NORTH-CENTRAL INTERIOR WET FLATWOODS

CES202.700

• Northeastern Pin Oak - Swamp White Oak Forest

These are closed to partially open, deciduous, seasonally flooded forests that occur in basin areas that are seasonally wet (winter and early spring) with a shallow, perched water table, which tend to be dry in late summer and early fall; pin oak (*Quercus palustris*), red maple, and swamp white oak (*Quercus bicolor*) are canopy dominants; occurs in Pennsylvania portion of the Delaware Estuary watershed……

Northeastern Pin Oak - Swamp White Oak Forest (CEGL006240)
KEY TO THE NATIONAL VEGETATION CLASSIFICATION ASSOCIATIONS IN THE DELAWARE ESTUARY

NORTHEASTERN INTERIOR DRY-MESIC OAK FOREST
CES202.592

• Northeastern Dry Oak-Hickory Forest CEGL006336
• Red Maple - Black Gum Basin Swamp CEGL006014
• White Pine - Oak Forest CEGL006293
• Virginia Pine Successional Forest CEGL002591
• Central Appalachian Forested Acid Seep CEGL006132
• Tuliptree - Beech - Maple Forest CEGL006296
• Northeastern Modified Successional Forest CEGL006599
• Red Maple - Tussock Sedge Wooded Marsh CEGL006119
• Successional Aspen / Grey Birch Forest CEGL006560
• Red Maple Upland Forest CEGL006547

1
Forests and shrub thickets of uplands (not wetlands) .........................................................2
Forests of wetlands or seeps .........................................................................................8

2
Forests dominated by conifer trees (evergreen trees >50% cover), deciduous trees < 20-25% of the total
canopy cover ..................................................................................................................3
Deciduous or mixed forests and woodlands: deciduous trees > 25% of the total canopy cover ..........4

3
Conifer forests with a predominant white pine (Pinus strobus) component ......................

White Pine - Oak Forest (CEGL006293)

Successional forests dominated by Virginia pine (Pinus virginiana) ..............................

Virginia Pine Successional Forest (CEGL002591)

4
Early successional forests with opportunistic species such as aspen (Populus spp.),
birch (Betula spp.),
cherry (Prunus spp.), and ash (Fraxinus spp.) ....................................................................5
Late successional hardwood forests with oaks (Quercus spp.), hickories (Carya spp.), beech (Fagus
grandifolia), and maples (Acer spp.) ..................................................................................7

5
Tree species may include black cherry (Prunus serotina), tuliptree (Liriodendron tulipifera), white ash
(Fraxinus americana), and red maple (Acer rubrum) ...............................................................6

Aspen (Populus spp.) and gray birch (Betula populifolia) early successional forest commonly found on
former agricultural land, in areas of ice scour along stream banks, and where there has been major
disturbance resulting in areas of exposed mineral soil ...................................................................
Successional Aspen / Grey Birch Forest (CEGL6560)

Red maple clearly dominated forest canopy; oaks, sweet birch (*Betula lenta*), tulip tree, black cherry white ash (*Fraxinus americana*), and hickories can be canopy associates; hay scented fern (*Dennstaedtia punctilobula*) dominates the groundstory.

Red Maple Upland Forest (CEGL6547)

Black cherry, tulip tree, white ash and red maple all share canopy dominance; other associates can include black walnut (*Juglans nigra*), sassafras (*Sassafras albidum*), eastern red cedar (*Juniperus virginiana*), and black locust (*Robinia pseudoacacia*); the herbaceous layer is variable, often containing grasses and forbs of both native and exotic origin.

Northeastern Modified Successional Forest (CEGL006599)

Oaks and hickories are dominant in tree canopy.

Northeastern Dry Oak-Hickory Forest (CEGL006336)

Hardwoods including tulip tree, American beech (*Fagus grandifolia*) and sugar maple (*Acer saccharum*) dominate the canopy.

Tuliptree - Beech - Maple Forest (CEGL006296)

Saturated swamp community that occupies saturated or seasonally wet basins.

Forested seep or wooded marsh community; not a swamp.

Red Maple - Black Gum Basin Swamp (CEGL006014)

Red maple swamps characterized by an herbaceous layer strongly dominated by sedges.

Central Appalachian Forested Acid Seep (CEGL006132)

Red maple wooded marshes characterized by an herbaceous layer strongly dominated by sedges.
SOUTHERN AND CENTRAL APPALACHIAN COVE FOREST
CES202.373

- Central Appalachian Rich Cove Forest
  - CEGL006237
- Calcareous Slope Forest
  - CEGL006020

This community occupies cool, mesic, lower to middle slopes, ravines, and coves at elevations; sugar maple (*Acer saccharum*), white ash (*Fraxinus americana*) and basswood (*Tilia americana*) are characteristic in the canopy; alternate leaf dogwood (*Cornus alternifolia*), witch hazel (*Hamamelis virginiana*), and spicebush (*Lindera benzoin*) frequent the shrub layer; occurs in Pennsylvania............

Central Appalachian Rich Cove Forest (CEGL006237)

This community occurs on slopes; densely vegetated; enriched, dry-mesic to mesic forest on talus or shallow, very rocky soils dominated by sugar maple and white ash; butternut (*Juglans cinerea*) is an associate. Shrub layer is characterized by bladdernut (*Staphylea trifolia*); herb layer is characterized by bladder ferns (*Cystopteris* spp.), woodsia ferns (*Woodsia* spp.), wild ginger (*Asarum canadense*), and others; tends to have more southern species that drop out at the northern edge of the range; PA....

Calcareous Slope Forest (CEGL006020)
Mixed Atlantic white-cedar - red maple swamp with canopy dominants Atlantic white cedar (*Chamaecyparis thyoides*) and red maple, other canopy associates include magnolia (*Magnolia virginiana*), black gum (*Nyssa sylvatica*), pitch pine (*Pinus rigida*)

Coastal Plain Atlantic White-cedar - Red Maple Swamp (CEGL006078)

Open-canopy Atlantic white-cedar swamp that occurs along streams of the Delmarva Peninsula; dominated by low-stature Atlantic white cedar in association with loblolly pine (*Pinus taeda*); seaside alder (*Alnus maritima*) is a characteristic shrub

Atlantic White-cedar / Seaside Alder Swamp (CEGL006307)
This floodplain swamp community occurs in New Jersey and potentially Delaware in the estuary; occurs in topographic depressions within alluvial floodplains; the tree canopy is dominated by pin oak (*Quercus palustris*), willow oak (*Quercus phellos*), red maple (*Acer rubrum*), and sweet gum (*Liquidambar styraciflua*).
**ATLANTIC COASTAL PLAIN MESIC HARDWOOD AND MIXED FOREST**

| Mesic Coastal Plain Oak Forest | CEGL006390 |
| Mid-Atlantic Mesic Mixed Hardwood Forest | CEGL006075 |
| Northern Coastal Plain/Piedmont Basic Mesic Hardwood Forest | CEGL006055 |
| Basic Mesic Ravine Forest | CEGL007181 |

1. Mesic hardwood forests; heaths may be present but not dominant; high species diversity; upland forests...

Mesic indicators present such as willow oak (*Quercus phellos*), highbush blueberry (*Vaccinium corymbosum*), or swamp doghobble (*Leucothoe racemosa*); generally located adjacent to wetlands or low areas...

**Mesic Coastal Plain Oak Forest** (CEGL006390)

2. Mesic forests of ravines...

Diverse forest of oaks, hickories, beech, tuliptree (*Liriodendron tulipifera*), sweet gum (*Liquidambar styraciflua*); holly (*Ilex opaca*) often present and usually abundant; herbaceous layer usually rich and may include may apple (*Podophyllum peltatum*), Solomon’s seal (*Polygonatum biflorum*), Christmas fern (*Polystichum acrostichoides*); forest of the coastal plain from Cape May, New Jersey and south...

**Northern Coastal Plain Mixed Hardwood Forest** (CEGL006075)

3. Dry to dry-mesic diverse hardwood forests of ravines; beech, oak, hickories in association with elms and black walnut (*Juglans nigra*)...

**Northern Coastal Plain / Northern Piedmont Basic Mesic Hardwood Forest** (CEGL006055)

Rich marl ravine forests of NJ; canopy dominants include beech, red and white oak, chinkapin oak (*Quercus muehlenbergii*), American basswood (*Tilia americana var. americana*), and tulip tree (*Liriodendron tulipifera*)...

**Basic Mesic Ravine Forest** (CEGL007181)
ATLANTIC COASTAL PLAIN NORTHERN BASIN PEAT SWAMP
CES203.522

- Coastal Plain Atlantic White-cedar - Red Maple Swamp
  CEGL006078
- Blueberry Wetland Thicket
  CEGL006371
- Atlantic White-cedar / Seaside Alder Swamp
  CEGL006307
- Southern Red Maple - Black Gum Swamp Forest
  CEGL006238
- Coastal Plain Atlantic White-Cedar Swamp
  CEGL006188
- Red Maple-Seaside Alder Woodland
  CEGL006317

1
Tall-shrub swamp where the dominant shrubs include highbush blueberry (*Vaccinium corymbosum*),
winterberry (*Ilex verticillata*), and swamp azalea (*Rhododendron viscosum*)

**Blueberry Wetland Thicket** (CEGL006371)

Swamp forests and wet woodlands ..........................................................2

2
Atlantic white cedar (*Chamaecyparis thyoides*) is a dominant or co-dominant in the canopy...........3
Atlantic white cedar not in the canopy..........................................................5

3
Atlantic white cedar swamps of streamsides and millponds; seaside alder (*Alnus maritima*) a characteristic
shrub; coastal plain pond species common associates such as yellow-eyed grasses, rushes,
beaksedges, fimbry, and others common......................................................

**Atlantic White Cedar / Seaside Alder Swamp** (CEGL006307)

Atlantic white cedar swamps of the glaciated coastal region or Atlantic coastal plain; coastal or coastal plain
indicators such as bayberry (*Morella pensylvanica*) and inkberry (*Ilex glabra*) present at least in low
cover........................................................................................................4

4
Atlantic white cedar swamp of the northern Atlantic coast north of the range of red bay (*Magnolia
virginiana*) from northern New Jersey coastal plain to Massachusetts; coastal indicators bayberry and
inkberry present at least at the wetland edge; wetland tending to be acidic and nutrient-poor............

**Northern Coastal Atlantic White Cedar Swamp** (CEGL006188)

Atlantic white cedar swamp of the Atlantic coastal plain (southern New Jersey to Delaware) with red bay as
a frequent canopy associate; occurs most frequently along water courses and thus receives some
seasonal flooding..........................................................................................5

**Coastal Plain Atlantic White-cedar - Red Maple Swamp** (CEGL006078)

5
Red maple and black gum dominant with magnolia frequent; restricted to groundwater-saturated stream
bottoms, seeping toeslopes, and poorly drained depressions with seasonally perched water tables

**Southern Red Maple - Black Gum Swamp Forest** (CEGL006238)
Red maple dominant with seaside alder dominant in the understory; found in Prime Hook National Wildlife Refuge in Delaware

Red Maple – Seaside Alder Woodland (CEGL006317)
**ATLANTIC COASTAL PLAIN NORTHERN BASIN SWAMP & WET HARDWOOD FOREST**

<table>
<thead>
<tr>
<th>CES203.520</th>
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<tbody>
<tr>
<td>• Coastal Loblolly Pine Wetland Forest</td>
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<td>• Chesapeake Red Maple Swamp</td>
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<tr>
<td>• Southern Red Maple - Black Gum Swamp Forest</td>
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<tr>
<td>• Red Maple - Sweetgum Swamp</td>
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<tr>
<td>• Cape May Lowland Swamp</td>
</tr>
<tr>
<td>• Coastal Plain Calcareous Seepage Swamp</td>
</tr>
<tr>
<td>• Southern New England Red Maple Seepage Swamp</td>
</tr>
</tbody>
</table>

1. Swamp forests needle-leaved or mixed with deciduous trees; loblolly pine (*Pinus taeda*) present in quantity (Cape May, NJ and northern Delaware only) ..............................................................
   Coastal Loblolly Pine Wetland Forest (CEGL006137)

2. Swamp forests deciduous........................................................................................................

3. Red maple swamps of alluvial floodplains, stream bottoms, headwaters; influenced by groundwater seepage ..........................................................................................................................3
   Red maple swamps of topographic basins or poorly drained lowlands or flats; not associated with river settings......................................................................................................................................6

4. Seepage swamp, New Jersey and points south........................................................................4
   Seepage swamp, New Jersey and points north........................................................................
   Southern New England Red Maple Seepage Swamp (CEGL006406)

5. Swamp characterized by high species diversity and calcium-requiring plants..........................5
   Not calcareous; swamp of the mid-Atlantic coastal plain (NJ, DE) characterized by lizard-tail (*Saururus cernuus*) and other forbs; diversity relatively low.................................................................
   Chesapeake Red Maple Swamp (CEGL006606)

6. Seepage swamp of southern New Jersey and possibly Maryland; pumpkin ash (*Fraxinus profunda*), sweet gum (*Liquidambar styraciflua*), southern swamp cottonwood (*Populus heterophylla*) characteristic; also characterized by high diversity and calcium-requiring plants such as swamp thistle (*Cirsium muticum*) and glade spurge (*Euphorbia purpurea*)..........................................................................................................................6
   Cape May Lowland Swamp (CEGL006013)
Seepage swamp forest in the southern portion of the coastal plain; occurs in ravines; green ash (*Fraxinus pensylvanica*) and waxmyrtle (*Morella cerifera*) present.................................................................

**Coastal Plain Calcareous Seepage Swamp** (CEGL006413)

6
Sweet gum present in canopy...............................................................................................................................7

Sweet gum not present; pronounced hummock – hollow micro-topography with moderately deep peat / muck accumulation .........................................................................................................................8

7
Common basin swamp of the coastal plain of New Jersey, DE and farther south; southern species typical; sweet bay swamps (*Magnolia virginiana*), sweet gum, swamp bay (*Persea palustris*) and others present in quantity........................................................................................................

**Southern Red Maple - Black Gum Swamp Forest** (CEGL006238)

Swamp of the coastal plain from PA and New Jersey south; vegetation occurring in seasonally flooded basins experiencing late-season draw-down; organic layer shallow to absent; sweetgum and black gum (*Nyssa sylvatica*) common; lacks southern species indicated above ............................................. ........

**Red Maple – Sweetgum Swamp** (CEGL006110)

8
Green ash prominent; spicebush (*Lindera benzoin*) and lizard-tail (*Saururus cernuus*) present, with relatively diverse herbaceous layer evident.................................................................

**Chesapeake Red Maple Swamp** (CEGL006606)

Black gum prevalent with red maple; herbaceous less diverse and less well-developed ........................................

**Southern Red Maple – Black Gum Swamp Forest** (CEGL006238)
**ATLANTIC COASTAL PLAIN NORTHERN BOG**

**CES203.893**

- Water-lily Aquatic Wetland
- Pitch Pine Bog
- Pine Barrens Bog
- Coastal Plain Atlantic White-cedar Swamp

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**1**
Forested bog or swamp communities with conifers dominating the canopy

Shrub or herbaceous wetland community

---

**2**
Bog with deep peat accumulation, pronounced floating mat and scattered pitch pine (*Pinus rigida*) canopy; shrub layer heavily dominated by leatherleaf (*Chamaedaphne calyculata*)

**Pitch Pine Bog** (CEGL006194)

Atlantic white cedar (*Chamaecyparis thyoides*) swamp of the northern Atlantic coast, north of the range of sweet bay (*Magnolia virginiana*) from northern New Jersey coastal plain to Massachusetts; coastal indicators bayberry (*Morella pensylvanica*), inkberry (*Ilex glabra*) present at least at the wetland edge; wetland tending to be acidic and nutrient-poor

**Northern Coastal Atlantic White Cedar Swamp** (CEGL006188)

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**3**
Aquatic herbaceous wetland community dominated by water lilies (*Nuphar lutea* ssp. *advena*) and (*Nymphaea odorata*)

**Water-lily Aquatic Wetland** (CEGL002386)

Dwarf shrub bog community dominated by leatherleaf; occurs in NJ pine barrens

**Pine Barrens Bog** (CEGL006208)
KEY TO THE NATIONAL VEGETATION CLASSIFICATION ASSOCIATIONS IN THE DELAWARE ESTUARY

ATLANTIC COASTAL PLAIN NORTHERN DUNE & MARITIME GRASSLAND
CES203.264

- Chesapeake Bay Tall Maritime Shrubland CEGL006319
- Beachgrass - Panicgrass Dune Grassland CEGL004043
- Interdune Switchgrass Brackish Depression CEGL004129
- Atlantic Coast Interdune Swale CEGL003839
- Northern Beachgrass Dune CEGL006274
- Northern Bayberry Dune Shrubland CEGL006295
- Blueberry Wetland Thicket CEGL006371
- Overwash Dune Grassland CEGL004097
- North Atlantic Coastal Plain Vine Dune CEGL003886
- Central Coast Beach Heather Dune Shrubland CEGL003950
- Pitch Pine Dune Woodland CEGL006117
- Northeastern Atlantic Brackish Interdunal Swale CEGL006342
- Maritime Red-cedar Woodland CEGL006212
- Loblolly Pine Dune Woodland CEGL006052
- Coastal Freshwater Marsh CEGL006935

1 Woody vegetation (woodland, shrubland, vineland) ................................................................. 2
Vegetation herbaceous or sparse (grassland, marsh, dune) ......................................................... 11

2 Shrubs or vines dominant vegetation .......................................................................................... 3
Woodland vegetation with open tree canopy .................................................................................. 9

3 Shrubland .................................................................................................................................... 4
Vines dominant (Virginia creeper, poison ivy, cat brier); shrubs, if present, covered by vines and senescing
North Atlantic Coastal Plain Vine Dune (CEGL003886)

4 Wetland shrub community ........................................................................................................... 5
Upland shrub community ................................................................................................................ 6

5 Interdunal swale community with water table less than 0.5 m below the surface; wax myrtle (Morella cerifera) dominates the shrub layer with groundsel tree (Baccharis halimifolia) and bayberry (Morella pensylvanica) as associates; salt hay (Spartina patens) dominates the herb layer .......................................................... Atlantic Coast Interdune Swale (CEGL003839)
Highbush blueberry (*Vaccinium corymbosum*) shrub wetland with thin layer of peat overlying sand; often occurs on the margins of ponds that draw down in late summer.

**Blueberry Wetland Thicket** (CEGL006371)

6
Dwarf shrubland of foredunes and dune slacks; unstable sand exposed in large patches; beach heather (*Hudsonia tomentosa*) dominant.

**Central Coast Beach Heather Dune Shrubland** (CEGL003950)

Shrubland occurs on stabilized or secondary dunes or in interdunal swales.

7
Interdunal swale community with water table less than 0.5 m below the surface; wax myrtle dominates the shrub layer with groundsel tree, and bayberry as associates; salt hay dominates the herb layer.

**Atlantic Coast Interdune Swale** (CEGL003839)

Coastal shrub community dominated by cherries and bayberries.

8
Tall, deciduous shrubland or scrub forest; black cherry (*Prunus serotina*), wax-myrtle and greenbrier (*Smilax rotundifolia*) common.

**Chesapeake Bay Tall Maritime Shrubland** (CEGL006319)

Knee-high to thigh-high shrubland; beach plum (*Prunus maritima*) and bayberry dominant.

**Northern Bayberry Dune Shrubland** (CEGL006295)

9
Woodland dune community dominated by pines.

**Maritime Red-Cedar Woodland** (CEGL006212)

10
Pitch pine (*Pinus rigida*) dominant; occurs on the backside of stabilized dunes; eastern red cedar and sassafras (*Sassafras albidum*) are typical canopy associates.

**Pitch Pine Dune Woodland** (CEGL006117)

Loblolly pine (*Pinus taeda*) dominant; beach heather dominates the dwarf-shrub layer; typically occurs adjacent to actively shifting foredune.

**Loblolly Pine Dune Woodland** (CEGL006052)

11
Herbaceous vegetation of seasonally or semi-permanently flooded swales, depressions and marshes.

Herbaceous or sparse vegetation of uplands or upper beaches.
12
Swale and depression communities
Overwash and marsh communities

13
Shrubs such as wax myrtle may be present at low cover
Swale of low diversity, generally closer to ocean; salt hay dominant; small spike rush (*Eleocharis parvula*) common

Northeastern Atlantic Brackish Interdunal Swale (CEGL006342)

14
Switchgrass (*Panicum virgatum*) characteristic or dominant; seaside goldenrod (*Solidago sempervirens*) present

Interdune Switchgrass Brackish Depression (CEGL004129)

Atlantic Coast Interdune Swale (CEGL003839)

15
Salt hay dominated overwash terraces influenced by water-deposited sand caused by storm surges; seaside goldenrod is an occasional associate

Overwash Dune Grassland (CEGL004097)

Three-square (*Schoenoplectus pungens var. pungens*) and Canada rush (*Juncus canadensis*) dominant; non-tidal freshwater marsh that occupies flooded depressions and swales in coastal dunes

Coastal Freshwater Marsh (CEGL006935)

16
American beach grass (*Ammophila brevigulata*) or panic grass (*Panicum* spp.) dominant

Overwash Dune Grassland (CEGL004097)

17
American beach grass and or panic grass dominant on foredunes; occurs almost exclusively on sandy, unstable, droughty substrates with no soil profile development

Beachgrass – Panicgrass Dune Grassland (CEGL004043)

Community is characterized and dominated by American beach grass; beach pea (*Lathyrus japonicus*) is the most common associate and can be codominant (not in DE); it occurs on active maritime dunes, on both foredunes that are exposed to onshore winds and salt spray as well as more protected interdunes

Northern Beachgrass Dune (CEGL006274)
KEY TO THE NATIONAL VEGETATION CLASSIFICATION ASSOCIATIONS IN THE DELAWARE ESTUARY

ATLANTIC COASTAL PLAIN NORTHERN PITCH PINE LOWLAND
CES203.374

- Pine Barrens Sandreed Savanna CEGL006397
- Pitch Pine Subhydric Lowland CEGL006387
- Southern Red Maple - Black Gum Swamp Forest CEGL006238
- Pitch Pine Bog CEGL006194
- Pine Barrens Bog CEGL006208
- Pitch Pine - Reedgrass Savanna CEGL006388
- Pitch Pine Lowland CEGL006388
- Highbush Blueberry Bog Thicket CEGL006190
- Upper South Switchgrass Wet Prairie CEGL004128
- Pine Barrens Floodplain Forest CEGL006918

1 Forested wetland community; swamp................................................................. 2
   Shrub or herbaceous wetland..............................................................................6

2 Swamp forests dominated by pitch pine (Pinus rigida) or mixed with deciduous trees .................................. 3
   Swamp forests deciduous..................................................................................9

3 Bog wetland with deep peat accumulation, pronounced floating mat and scattered pitch pine canopy; shrub
   layer heavily dominated by leatherleaf (Chamaedaphne calyculata)...................... Pitch Pine Bog (CEGL006194)
   Pitch pine-dominated wetlands of NJ pine barrens; shallow peat accumulation or overlying saturated sands;
   or if deep organic layer is present, grasses rather than dwarf shrubs dominate ground layer......... 4

4 Pineland reedgrass (Calamovilfa brevipilis) dominates the ground layer; scattered shrub layer characterized
   by dwarf huckleberry (Gaylussacia dumosa)...................................................... Pitch Pine – Pine Reedgrass Savanna (CEGL006388)
   Dwarf shrubs dominate the ground layer............................................................5

5 Water present at surface or just below; red maple (Acer rubrum) and black gum (Nyssa sylvatica) often
   present with pitch pine canopy. Shrub layer is relatively diverse, with highbush blueberry (Vaccinium
corymbosum), sheep laurel (Kalmia angustifolia) and others; sphagnum mosses are common.......... Pitch Pine Lowland (CEGL006195)
Surface water not present, but soils mottled and mesic species (highbush blueberry, inkberry) present........

**Pitch Pine Subhydric Lowland** (CEGL006387)

6  Shrub dominated bog community........................................................................................................7
6  Herbaceous wetland community........................................................................................................8

7  Shrub bogs dominated by highbush blueberry (*Vaccinium corymbosum*)...........................................

**Highbush Blueberry Bog Thicket** (CEGL006190)

Dense leatherleaf (*Chamaedaphne calyculata*) occurs over a continuous carpet of *Sphagnum* moss.

Walter’s sedge (*Carex striata*) is interspersed within the dwarf-shrubs or forms significant cover in wetter openings........................................................................................................................................

**Pine Barrens Bog** (CEGL006208)

8  Saturated wetland community of the New Jersey Pine Barrens dominated by pineland reed grass with associate dwarf huckleberry (*Gaylussacia dumosa*).................................................................

**Pine Barrens Sandreed Savanna** (CEGL006397)

Seasonally flooded herbaceous vegetation community dominated by switch grass (*Panicum virgatum*) in the New Jersey pine barrens..................................................................................................................7

**Upper South Switchgrass Wet Prairie** (CEGL004128)

9  Common basin swamp of the coastal plain of New Jersey and south; southern species red bay (*Magnolia virginiana*), sweet gum (*Liquidambar styraciflua*), swamp bay (*Persea palustris*) and others present in quantity......................................................................................................................................

**Southern Red Maple – Black gum Swamp Forest** (CEGL006238)

Temporarily flooded floodplain forest associated with small streams in the pine barrens; canopy is codominated by green ash (*Fraxinus pennsylvanica*), black walnut (*Juglans nigra*), and American elm (*Ulmus americana*).................................................................................................................................

**Pine Barrens Floodplain Forest** (CEGL006918)
1
Vegetation dominated by trees........................................................................................................................................2
Vegetation not dominated by trees; shrublands, meadows, pondshores ......................................................................3

2
Basin wetland dominated by red maple (Acer rubrum) and sweet gum (Liquidambar styraciflua)..................... Red Maple – Sweetgum Swamp (CEGL006110)
Temporarily flooded floodplain forest associated with small streams typically in the pine barrens; canopy is
codominated by green ash (Fraxinus pennsylvanica), black walnut (Juglans nigra), and American elm
(Ulmus americana)............................................................................................................................................................. Pine Barrens Floodplain Forest (CEGL006918)

3
Shrub dominated vegetation; (>10%) cover of shrubs .................................................................................................4
Herbaceous dominated vegetation..................................................................................................................................7

4
Vegetation of the lowest, wettest portion of ponds with permanent, or of very deep muck.................................5
Vegetation on outer margin of pond, or adjacent to pond...............................................................................................6

5
Buttonbush (Cephalanthus occidentalis) dominant........................................................................................................ Buttonbush Coastal Plain Pond (CEGL006242)
Swamp loosestrife (*Decodon verticillatus*) dominant

**Swamp-loosestrife Coastal Plain Pond** (CEGL006087)

6

Highbush blueberry shrub wetland with thin layer of peat overlying sand; often occurs on the margins of ponds that draw down in late summer.

**Blueberry Wetland Thicket** (CEGL006371)

Swamp loosestrife (water willow) dominant

**Water-willow Shrub Swamp** (CEGL005089)

7

Vegetation of the highest outer margin of the pond

Vegetation of the central or lower shore, or emergent

8

Diverse pond shore with shared dominance of beaksedge (*Rynchospora* spp.), warty panic-grass (*Panicum verrucosum*), savanna nutrush (*Scleria verticillata*)

**Coastal Plain Muck Pondshore** (CEGL006264)

One species dominated ponds shore; monotypic

9

Switch grasses (*Panicum* spp.) dominant

Northern peatland sedge (*Carex striata* var. *brevis*) dominant

**Peatland Sedge Pondshore** (CEGL004120)

10

Maidencane (*Panicum hemitomon*) is the dominant species, often occurring in monotypic stands

**Panic-grass Pondshore** (CEGL006338)

Seasonally flooded herbaceous vegetation community dominated by switch grass (*Panicum virgatum*) in the New Jersey pine barrens

**Upper South Switchgrass Wet Prairie** (CEGL004128)

11

Floating-leaved species, generally water-lilies, present in abundance

**Coastal Plain Pond** (CEGL006086)

Vegetation comprised of low grasses or grass-like plants, or small-statured forbs without floating leaves

12

Vegetation characterized by rushes and sedges; Canada rush (*Juncus canadensis*) and three-way sedge (*Dulichium arundinaceum*)
Three-way Sedge – Canada Rush Coastal Plain Pond (CEGL006415)
Vegetation characterized by grasses and/or rushes

13
Vegetation occurs only in Delaware within the Delaware Estuary watershed

Vegetation occurs in New Jersey and possibly Delaware; discernible basin wetland, occurring in the central lowest portion; featherfoil (*Hottonia inflata*) and creeping lovegrass (*Eragrostis hypnoides*) characteristic

Creeping Lovegrass Coastal Plain Pond (CEGL006608)

14
Vegetation comprised of yellow spikerush (*Eleocharis flavescens*), yellow-eyed grasses (*Xyris* spp.), and other coastal plain pond species; forming poorly consolidated mats in a large wetland complex; known from Prime Hook NWR in Delaware

Deep Muck Coastal Plain Pond (CEGL006400)

Twigrush (*Cladium mariscoides*) and wrinkled jointgrass (*Coelorachis rugosa*) dominant; uncommon vegetation type currently known only from Assasowoman Bay Wildlife Management Area in Delaware

Cape May Delmarva Depression Meadow (CEGL006332)
ATLANTIC COASTAL PLAIN SMALL BROWNWATER RIVER FLOODPLAIN FOREST
CES203.250

- Southern Coastal Plain Cottonwood - Willow Riverfront Forest CEGL007346
- Coastal Plain Streamside Forest CEGL006603
- Aluvial Alder Swamp CEGL006414
- Coastal Plain Oak Floodplain Swamp CEGL006605
- Successional Sweetgum Floodplain Forest CEGL007330

1
Forest community

Shrubland community dominated silky dogwood (*Cornus amomum*) and brook-side alder (*Alnus serrulata*) dominant; buttonbush is often an associate shrub.

   Alluvial Alder Swamp (CEGL006414)

2
Wetland forests of floodplains

Wetland forest of alluvial backswamps; pin oak (*Quercus palustris*) prominent.

   Coastal Plain Oak Floodplain Swamp (CEGL006605)

3
Natural floodplain communities

Altered forests of floodplains; sweetgum (*Liquidambar styraciflua*) prevalent.

   Successional Sweetgum Floodplain Forest (CEGL007330)

4
Sycamore (*Platanus occidentalis*) present; vegetation of braided streams

   Coastal Plain Streamside Forest (CEGL006603)

Cottonwood (*Populus deltoides*) and black willow (*Salix nigra*) dominant; vegetation occurs along the fronts and banks of large rivers and on islands where sediment accretes; in the New Jersey portion of the estuary.

   Southern Coastal Plain Cottonwood - Willow Riverfront Forest (CEGL007346)
NORTH ATLANTIC COASTAL PLAIN BRACKISH TIDAL MARSH
CES203.894

• Alkali Bulrush Brackish Marsh CEGL006416
• Cattail Brackish Tidal Marsh CEGL004201
• Central Atlantic Brackish Marsh CEGL006417
• Mesohaline Seepage Marsh CEGL006418
• North Atlantic Coast Intertidal Mud Flat CEGL004473
• Brackish Tidal Low Marsh CEGL004193
• Water-hemp Tidal Marsh CEGL006080
• Atlantic Giant Cordgrass Marsh CEGL004195
• Transitional Tidal Marsh CEGL006612
• Atlantic Coast Brackish Tidal Marsh CEGL004188

1
Vegetation of sandy or gravelly substrates that are freely drained ...................................................... 2
Vegetation of organic substrates (peat, muck) ........................................................................................ 3

2
Vegetation usually sparse, low species diversity; characterized by graminoids (grass-like plants);
Threesquare (*Schoenoplectus pungens*) characteristic; associated with large rivers .........................

Atlantic Coast Brackish Tidal Marsh (CEGL004188)

Vegetation better developed; higher species diversity characterized by forbs; water hemp (*Amaranthus
cannabinus*) characteristic .................................. ..................................................

Water-hemp Tidal Marsh (CEGL006080)

3
Vegetation of low marshes or flats; adjacent to river; regularly flooded; subject to ice scour .......... 4
Vegetation of mid or high marsh; flooding less regular ........................................................................... 5

4
Sparse vegetation consisting of short forbs on mud flat; characteristic plants are low-growing rosette
species; awl-leaf arrowhead (*Sagittaria subulata*) and Welsh mudwort (*Limosella australis*) common....

North Atlantic Coast Intertidal Mud Flat (CEGL004473)

Tall grasses or grass-like plants dominant; may be mixed with forbs; saltwater cordgrass (*Spartina
alterniflora*) dominant .........................................................................................................................

Brackish Tidal Low Marsh (CEGL004193)

5
Vegetation of high salt marsh; meanders and areas adjacent to uplands ................................................ 6
Transition from low marsh to high marsh, low areas within high marsh; occurs primarily in the Chesapeake Bay ecoregion and in the Delaware portion of the estuary.

### Transitional Tidal Marsh (CEGL006612)

6. Vegetation of meanders and adjacent to uplands, exposed to freshwater seepage rather than the freshwater input from the river; diverse mixture of freshwater forbs with freshwater cordgrass.

#### Mesohaline Seepage Marsh (CEGL006418)

6. Vegetation less diverse mixture of saltwater cordgrass with other grasses or grasslike plants.

7. Saltwater cordgrass a major component.

8. Saltwater cordgrass absent or negligible.

7. Saltwater cordgrass and water-hemp (*Amaranthus cannabinus*) co-dominant; mid-tidal portion of rivers in Delaware and Maryland.

#### Central Atlantic Brackish Marsh (CEGL006417)

8. Saltwater cordgrass and alkali bulrush (*Schoenoplectus robustus*) co-dominant.

#### Alkali Bulrush Brackish Marsh (CEGL006416)


#### Cattail Brackish Tidal Marsh (CEGL004201)


#### Atlantic Giant Cordgrass Marsh (CEGL004195)
**NORTH ATLANTIC COASTAL PLAIN DRY HARDWOOD FOREST**

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<th>Association</th>
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<tr>
<td>North Atlantic Coastal Oak - Holly Forest</td>
<td>CEGL006378</td>
</tr>
<tr>
<td>Mid-Atlantic Mesic Mixed Hardwood Forest</td>
<td>CEGL006075</td>
</tr>
<tr>
<td>Northeastern Dry Oak-Hickory Forest</td>
<td>CEGL006336</td>
</tr>
<tr>
<td>Coastal Oak / Laurel Forest</td>
<td>CEGL006374</td>
</tr>
<tr>
<td>Northeastern Coastal Oak - Heath Forest</td>
<td>CEGL006375</td>
</tr>
<tr>
<td>Northeastern Atlantic Coastal Oak - Beech Forest</td>
<td>CEGL006377</td>
</tr>
<tr>
<td>Southern Red Oak / Heath Forest</td>
<td>CEGL006269</td>
</tr>
<tr>
<td>Coastal Plain Chestnut Oak - Beech Forest</td>
<td>CEGL006919</td>
</tr>
<tr>
<td>Xeric Paleodune Oak-Sand Hickory Woodland</td>
<td>CEGL006954</td>
</tr>
</tbody>
</table>

1. Oaks dominant; few other hardwood genera present in the canopy; scattered pines sometimes present. 2
   - Oaks combined with other nut-bearing hardwood species such as beech \((Fagus grandifolia)\) and hickories \((Carya spp.)\) comprise the canopy. 5

2. Dry oak forests with heaths such as blueberries and huckleberries prominent in the shrub layer; southern red oak \((Quercus falcata)\) a characteristic oak. 3
   - Oak forests with heaths in the understory; southern red oak absent; forests ranging from Cape May, New Jersey and northwards. 4

3. Common and widespread mixed oak forests on the Coastal Plain from New Jersey to Virginia; forests of southern New Jersey and south; loblolly pine \((Pinus taeda)\) may be present.  
   - **Southern Red Oak / Heath Forest** (CEGL006269)
     - Rare community unique to xeric paleodunes on Maurice River terraces in New Jersey; southern red oak, white oak \((Quercus alba)\), black oak \((Quercus velutina)\), and post oak \((Quercus stellata)\), with smaller amounts of sassafras \((Sassafras albidum)\) and sand hickory \((Carya pallida)\); pitch pine may be present and Pennsylvania sedge \((Carex pensylvanica)\) is widespread in the herb stratum.  
     - **Xeric Paleodune Oak-Sand Hickory Woodland** (CEGL006954)

4. Heath understory dominated by evergreen mountain laurel \((Kalmia latifolia)\).  
   - **Coastal Oak / Laurel Forest** (CEGL006374)
     - Heath understory deciduous (blueberries, huckleberries); chestnut oak \((Quercus prinus)\) absent or of low cover; common oak forest type of the northeast, occurring in coastal areas and in dry soils inland.  
     - **Northeastern Coastal Oak / Heath Forest** (CEGL006375)
Beech and other hardwoods contribute substantial cover with oaks................................. 6
Beech minor to absent... ........................................................................................................... 8

Diverse forest of oaks, hickories, beech, tuliptree (*Liriodendron tulipifera*), sweet gum (*Liquidambar styraciflua*); holly (*Ilex opaca*) often present and usually abundant; herbaceous layer usually rich and may include may apple (*Podophyllum peltatum*), Solomon's seal (*Polygonatum biflorum*), Christmas fern (*Polystichum acrostichoides*); forest of the coastal plain from Cape May, New Jersey and south... Northern Coastal Plain Mixed Hardwood Forest (CEGL006075)

Forest dominated by oaks and beech; less diverse and less rich........................................... 7

Forest dominated by white oak, black oak and beech; few shrubs in understory; herbaceous layer typically contains Canada mayflower (*Maianthemum canadense*) and seedlings from the canopy...........................

Coastal Oak – Beech Forest (CEGL006377)

Chestnut oak (*Quercus prinus*) dominant along with black oaks and beech; flowering dogwood (*Cornus florida*) is typically also present, occasionally with American holly. The shrub stratum is strongly dominated by mountain laurel.................................................................................................

Coastal Plain Chestnut Oak - Beech Forest (CEGL006919)

Hickories an important component of the canopy................................................................. 9

Mixed hardwood canopy with holly abundant in the understory; dogwood absent........

Coastal Oak / Holly Forest (CEGL006378)

Mixed canopy of oaks and hickories with dogwood and maple leaf viburnum (*Viburnum acerifolium*) prominent in the understory............................................................................................

Northeastern Dry Oak – Hickory Forest (CEGL006336)

Rare community unique to xeric paleodunes on Maurice River terraces in New Jersey; southern red oak, white oak, black oak, and post oak, with smaller amounts of sassafras and sand hickory, pitch pine may be present and Pennsylvania sedge is widespread in the herb stratum............................................................

Xeric Paleodune Oak-Sand Hickory Woodland (CEGL006954)
KY TO THE NATIONAL VEGETATION CLASSIFICATION ASSOCIATIONS IN THE DELAWARE ESTUARY

NORTH ATLANTIC COASTAL PLAIN FRESH AND Oligohaline Tidal Marsh
CES203.516

- Sweetflag Tidal Marsh CEGL006833
- Estuary Quillwort Tidal Flat CEGL006058
- American Lotus Tidal Marsh CEGL006913
- North Atlantic Fresh Tidal Shrub Swamp CEGL006337
- Oligohaline Mixed Forbs Marsh CEGL006181
- Estuary Pipewort Freshwater Intertidal Flat CEGL006352
- Pond-lily Tidal Marsh CEGL004472
- Pickerelweed Tidal Marsh CEGL004706
- Water-hemp Tidal Marsh CEGL006080
- Atlantic Coast Wild Rice Tidal Marsh CEGL004202
- Freshwater Tidal Mixed Forbs High Marsh CEGL006325
- Atlantic Coast Brackish Tidal Marsh CEGL004188
- Coastal Freshwater Marsh CEGL006935
- Water-willow Shrub Swamp CEGL005089

1
Shrub or woody vegetation dominant.................................................................2
Herbaceous or grass vegetation dominant..........................................................3

2
Swamp loosestrife (Decodon verticillatus) dominant..............................................Water-willow Shrub Swamp (CEGL005089)
Alders (Alnus serrulata and/or Alnus incana ssp. rugosa) and dogwoods (Cornus amomum) dominant......North Atlantic Fresh Tidal Shrub Swamp (CEGL006337)

3
Vegetation adjacent to river and is regularly flooded and exposed.........................................................4
Vegetation separated from river by other vegetation; irregularly flooded low-lying swales within higher
marsh.................................................................................................................14

4
Vegetation of shores of large tidal rivers, substrate scoured by ice and flooding; vegetation of variable
cover; sandy or gravelly substrate ........................................................................5
Vegetation of the main-stem of tidal river or its tributaries; more protected.................................7

5
Vegetation forb-dominated; relatively high cover; tall.........................................................Water-hemp Tidal Marsh (CEGL006080)
Threesquare (Schoenoplectus pungens var. pungens) characteristic........................................6
KEY TO THE NATIONAL VEGETATION CLASSIFICATION ASSOCIATIONS IN THE DELAWARE ESTUARY

6
Vegetation dense, diverse, non-tidal freshwater marsh dominated by threesquare, hibiscus (*Hibiscus moscheutos*), rushes (*Juncus* spp.) and ferns (*Osmunda* spp.); occupies flooded depressions and swales in coastal dunes and impoundments; can also occur at the mouth of large rivers, on hummocky islands in freshwater wetlands, and in transition zones.

**Coastal Freshwater Marsh** (CEGL006935)

Vegetation usually sparse, low species diversity; tidal marsh characterized by graminoids (grass-like plants); threesquare characteristic; associated with large rivers.

**Atlantic Coast Brackish Tidal Marsh** (CEGL004188)

7
Low vegetation of sandy or gravelly substrate.

**Estuary Pipewort Brackish Intertidal Flat** (CEGL006352)

Vegetation of finer-grained silty or mucky sediments.

8
Low vegetation, rosette-forming, often sparse.

**Estuary Quillwort Tidal Flat** (CEGL006058)

Vegetation taller.

9
Tall grasses dominant; characterized by wild rice (*Zizania aquatica*).

**Atlantic Coast Wild Rice Tidal Marsh** (CEGL004202)

Forbs, rushes and ferns dominant.

10
Vegetation dense, diverse, non-tidal freshwater marsh dominated by threesquare, hibiscus (*Hibiscus moscheutos*), rushes (*Juncus* spp.) and ferns (*Osmunda* spp.); occupies flooded depressions and swales in coastal dunes and impoundments; can also occur at the mouth of large rivers, on hummocky islands in freshwater wetlands, and in transition zones.

**Coastal Freshwater Marsh** (CEGL006935)

Forbs dominant.

11
High diversity with many species of forbs.

**Oligohaline Mixed Forbs Marsh** (CEGL006181)

Lower diversity; often a monoculture of emergent / aquatic herbs.

12
Emergent vegetation; arrow-arum (*Peltandra virginica*) and pickerel-weed (*Pontedaria cordata*) dominant.

**Pickerelweed Tidal Marsh** (CEGL004706)
Water-lilies or American lotus dominant………………………………………………………………………………………………………..13

13
Yellow water-lily (Nuphar lutea ssp. advena) dominant ........................................................................................................ Pond Lily Tidal Marsh (CEGL004472)

American lotus (Nelumbo lutea) dominant......................................................................................................................... American Lotus Tidal Marsh (CEGL006913)

14
Sweetflag (Acorus calamus) dominant.............................................................................................................................. Sweetflag Tidal Marsh (CEGL006833)

Higher diversity marsh..........................................................................................................................................................15

15
Arrow-arum, jewelweed (Impatiens spp.), cattails (Typha spp.) often present................................................................. Freshwater Tidal Mixed Forbs High Marsh (CEGL006325)

Vegetation dense, diverse, non-tidal freshwater marsh dominated by threesquare (Schoenoplectus pungens var. pungens), hibiscus (Hibiscus moscheutos), rushes (Juncus spp.) and ferns (Osmunda spp.); occupies flooded depressions and swales in coastal dunes and impoundments; can also occur at the mouth of large rivers, on hummocky islands in freshwater wetlands, and in transition zones……. Coastal Freshwater Marsh (CEGL006935)
### Key to the National Vegetation Classification Associations in the Delaware Estuary

**North Atlantic Coastal Maritime Forest**

<table>
<thead>
<tr>
<th>Association</th>
<th>Code</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inland Dune Ridge Forest</td>
<td>CEGL006354</td>
</tr>
<tr>
<td>Chesapeake Bay Tall Maritime Shrubland</td>
<td>CEGL006319</td>
</tr>
<tr>
<td>Successional Maritime Forest</td>
<td>CEGL006145</td>
</tr>
<tr>
<td>Coastal Loblolly Pine Wetland Forest</td>
<td>CEGL006137</td>
</tr>
<tr>
<td>Northern Bayberry Dune Shrubland</td>
<td>CEGL006295</td>
</tr>
<tr>
<td>Maritime Holly Forest</td>
<td>CEGL006376</td>
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<td>Pitch Pine Dune Woodland</td>
<td>CEGL006117</td>
</tr>
<tr>
<td>Coastal Pitch Pine / Scrub Oak Barren</td>
<td>CEGL006315</td>
</tr>
<tr>
<td>Maritime Red-cedar Woodland</td>
<td>CEGL006212</td>
</tr>
<tr>
<td>Loblolly Pine Dune Woodland</td>
<td>CEGL006052</td>
</tr>
<tr>
<td>Lower New England Red Maple - Black Gum Swamp</td>
<td>CEGL006156</td>
</tr>
</tbody>
</table>

1. Forest or woodland dominated community ................................................................. 2
   Shrubland ....................................................................................................................... 10

2. Upland community; occurring on dunes, and sandy soils ............................................... 3
   Wetland forested community ............................................................................................. 9

3. Coniferous or broadleaved evergreen trees dominate the canopy .................................... 4
   Deciduous trees dominate; stunted black cherry (*Prunus serotina*), sassafras (*Sassafras albidum*), and serviceberry (*Amelanchier canadensis*) are dominant with admixtures of pitch pine (*Pinus rigida*) and eastern red cedar (*Juniperus virginiana*) .......................................................... **Successional Maritime Forest** (CEGL006145)

4. Pines dominant in canopy .................................................................................................. 5
   Pines not dominant in canopy or not present; holly (*Ilex opaca*) or eastern red cedar dominant ....... 8

5. Pitch pine dominant ............................................................................................................. 6
   Pitch pine not dominant; Virginia pine (*Pinus virginiana*) or loblolly pine (*Pinus taeda*) dominant ........... 7

6. Pine-scrub oak barren with scrub oak (*Quercus ilicifolia*) as the dominant shrub and bayberry (*Morella pensylvanica*) usually present; dwarf shrubs such as box huckleberry (*Gaylussacia baccata*) and
lowbush blueberries (Vaccinium spp.) as well as grasses little bluestem (Schizachyrium scoparium) and wavy hair grass (Deschampsia flexuosa) are typically present…………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………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### NORTH ATLANTIC COASTAL PLAIN PITCH PINE BARRENS  
CES203.269

<table>
<thead>
<tr>
<th>Description</th>
<th>Classification Code</th>
</tr>
</thead>
<tbody>
<tr>
<td>Southern New Jersey Mesic Pine Barrens</td>
<td>CEGL006115</td>
</tr>
<tr>
<td>Mid-Successional Pine - Oak Woodland</td>
<td>CEGL006383</td>
</tr>
<tr>
<td>Coastal Plain Mesic Pine Barrens</td>
<td>CEGL006384</td>
</tr>
<tr>
<td>New Jersey Pitch Pine / Scrub Oak Barren</td>
<td>CEGL006051</td>
</tr>
<tr>
<td>Coastal Pitch Pine / Scrub Oak Barren</td>
<td>CEGL006315</td>
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<td>Pitch Pine - Oak Forest</td>
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</tr>
<tr>
<td>Pitch Pine / Pennsylvania Sedge Woodland</td>
<td>CEGL006385</td>
</tr>
<tr>
<td>Pine Barrens Hilltop Forest</td>
<td>CEGL006334</td>
</tr>
<tr>
<td>Black Locust Successional Forest</td>
<td>CEGL007279</td>
</tr>
</tbody>
</table>

1. Pitch pine (*Pinus rigida*) and/or tree oaks dominate forest or woodland canopy……………………………………2
   - Black locust (*Robinia pseudoacacia*) dominant………………………………………………………………………………2
     **Black Locust Successional Forest** (CEGL007279)

2. Scrub oak (*Quercus ilicifolia*) minor or lacking; grasses and / or tree oaks may or may not be present in quantity; canopy closed to partially open; sedges, grasses or blueberries and huckleberries prominent in the ground layer. ................................................................. 3
   - Pitch pine and scrub oak both present in quantity; canopy more open; vegetation known as "pitch pine – scrub oak barrens". ............................................................................................................ 6

3. Tree oaks prevalent with or without pitch pine.......................................................... 4
   - Tree oaks absent or nearly so; xeric pitch pine woodland, shrub layer poorly developed and lacking scrub oak; Pennsylvania sedge (*Carex pensylvanica*) dominant in the ground story.................................................................................. 3
     **Pitch Pine / Pennsylvania Sedge Woodland** (CEGL006385)

4. Chestnut oak (*Quercus prinus*) and black oak (*Quercus velutina*) form 90% of the canopy cover with heaths in the shrub layer; mosses and lichens abundant; occurs on low pine barren hilltops................................. 5
   - Pitch pine more prominent in mixed tree oak canopy....................................................... 5
     **Pine Barrens Hilltop Forest** (CEGL006334)

5. Open pine barrens with pitch pine and a mixture of tree oaks including scarlet oak (*Quercus coccinea*), black oak, white oak (*Quercus alba*), and post oak (*Quercus stellata*) in the canopy; scrub oak typical in the shrub layer and heaths in the groundstory........................................................................................................... 6
   - **Mid-Successional New Jersey Pine-Oak Woodland** (CEGL006383)
Pitch pine and tree oaks including scarlet oak, black oak, white oak and northern red oak (*Quercus falcata*) dominate the canopy; bayberry (*Morella pensylvanica*) is usually present; large-patch to matrix forest type; bracken fern (*Pteridium aquilinum*) and Pennsylvania sedge characterize the ground cover layer...

**Pitch Pine – Oak Forest** (CEGL006381)

6

Pitch pine / scrub oak woodlands found immediately adjacent to wetlands or in low areas; species of slightly higher soil moisture such as inkberry (*Ilex glabra*), sweet pepper bush (*Clethra alnifolia*), highbush blueberry (*Vaccinium corymbosum*) present; soil mottles usually present

Dry pitch pine / scrub oak barrens lacking mesic species, generally not found immediately adjacent to wetlands or in low areas; soil mottles absent

7

Mesic woodlands of the New Jersey Pine Barrens; sheep laurel (*Kalmia angustifolia*) and flowering pixie moss (*Pyxidanthera barbulata*) are characteristic

**Coastal Plain Mesic Pine Barrens** (CEGL006384)

Mesic pine barrens of generally south of the Mullica River in New Jersey; holly (*Ilex opaca*) and dogwood (*Cornus florida*) characteristic

**Southern New Jersey Mesic Pine Barrens** (CEGL006115)

8

Pitch pine / scrub oak barrens of the coastal region north of New Jersey; bayberry usually present at least in the vicinity (may not be dominant); dwarf shrubs including huckleberry and low bush blueberries typical; little bluestem (*Schizachyrium scoparium*) and hair grass (*Deschampsia flexuosa*) may be present in patches

**Coastal Pitch Pine / Scrub Oak Barren** (CEGL006315)

Open pitch pine / scrub oak barrens typical of New Jersey; bayberry absent

9

Open pine barrens of NJ; tree oaks absent or nearly so; scrub oak and / blackjack (*Quercus marilandica*) oak dominant in the shrub layer; pyxie moss often dominates the groundstory

**New Jersey Pitch Pine / Scrub Oak Barren** (CEGL006051)

Open pine barrens of NJ with tree oaks common in the canopy and heaths in the groundstory

**Mid-Successional New Jersey Pine-Oak Woodland** (CEGL006383)
Beach community occurring just above the wrack line on beaches and foredunes on well-drained sands at and often gravels and cobbles; flooded irregularly by storm tides, dominated by annuals such as sea rocket (*Cakile edulenta*)

**North Atlantic Upper Ocean Beach** (CEGL004400)

Beach community occurring along low-energy shores protected from strong wave action typically on the back side of barrier islands; dominated by scattered mats of succulent vegetation consisting primarily of *Cenicilla (Sesuvium portulacastrum)*, *Sea-purslane (Sesuvium maritimum)*, *Halberd-Leaf Orache (Atriplex patula)*, and *narrow-leaf seepweed (Suaeda linearis)*; only reported in Delaware

**Coastal Bay Shore / Succulent Beach** (CEGL004406)
NORTH ATLANTIC COASTAL PLAIN SEAGRASS BED
CES203.246

- Northern Atlantic Coast Beaked Ditch-grass Bed CEGL006167

Ditch-grass (*Ruppia maritime*) beds occurring in habitats that are continuously flooded by brackish water; in subtidal, deepwater pools and pannes, tidal creeks, and flats within salt marshes, or along tidal rivers.....................................................................................................................

Northern Atlantic Coast Beaked Ditch-grass Bed (CEGL006167)
 Beds of aquatic vegetation occurring on fresh to slightly brackish flats that are continuously flooded, although certain areas can be exposed briefly during very low tides; common species include Sago pondweed (*Stuckenia pectinata*), clasping-leaf pondweed (*Potamogeton perfoliatus*), and horned pondweed (*Zannichellia palustris*) (note: clasping-leaf pondweed is not common in DE)..........................

Central Atlantic Freshwater Subtidal River Bed (CEGL006027)
### NORTH ATLANTIC COASTAL PLAIN TIDAL SALT MARSH

<table>
<thead>
<tr>
<th>Association</th>
<th>Code</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cattail Brackish Tidal Marsh</td>
<td>CEGL004201</td>
</tr>
<tr>
<td>Mid-Atlantic High Salt Marsh</td>
<td>CEGL004197</td>
</tr>
<tr>
<td>Eastern Reed Marsh</td>
<td>CEGL004141</td>
</tr>
<tr>
<td>Salt Panne (Salicornia Type)</td>
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<tr>
<td>Mid-Atlantic Maritime Salt Shrub</td>
<td>CEGL003921</td>
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<tr>
<td>Salt Panne Pool</td>
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<tr>
<td>Tidal Reed-grass Marsh</td>
<td>CEGL004187</td>
</tr>
<tr>
<td>Brackish Meadow</td>
<td>CEGL006150</td>
</tr>
<tr>
<td>Maritime Red-cedar Woodland</td>
<td>CEGL006212</td>
</tr>
<tr>
<td>North Atlantic Low Salt Marsh</td>
<td>CEGL004192</td>
</tr>
<tr>
<td>North Atlantic High Salt Marsh</td>
<td>CEGL006006</td>
</tr>
</tbody>
</table>

1. Herbaceous vegetation predominant ................................................................. 2
   Woody vegetation predominant .............................................................................. 10

2. Vegetation of low, regularly flooded salt marshes and flats saltmarsh cordgrass (*Spartina alterniflora*) strongly dominant, often monoculture .......................................................................................................................... North Atlantic Low Salt Marsh (CEGL004192)

Vegetation of high salt marshes, transition zones between marshes, ponded areas, pannes; irregularly flooded by tides ........................................................................................................................................................................................................................................... 3

3. Low ponded areas within the high marsh; salt pannes and pools ................................................................. 4
   Higher marshes and transition zones ............................................................................. 5

4. Standing water always present; panne of restricted drainage; ditch-grass (*Ruppia maritima*) dominant .............. Salt Panne Pool (CEGL006370)

Substrate periodically exposed; saltworts (*Salicornia* spp.) dominant; short-form saltmarsh cordgrass may be present; salt panne of the North Atlantic Coast ................................................................................................................................. Salt Panne (CEGL004308)

5. Salt hay (*Spartina patens*) dominant; vegetation of high salt marsh ................................................................. 6
   Salt hay infrequent or absent; marshes of tidal creeks or rivers ......................................................................... 8
6
Vegetation of high salt marsh; low species diversity

Vegetation of ecotone (transition area between high and low marsh or high marsh and upland); switchgrass
(Panicum virgatum) characteristic; seaside goldenrod (Solidago sempervirens), sand sedge (Carex
siliae), and others present; relatively diverse vegetation from Massachusetts and south

Brackish Meadow (CEGL006150)

7
High marsh of New Jersey and north; blackgrass (Juncus gerardi) common

North Atlantic High Salt Marsh (CEGL006006)

High marsh of Delaware, Maryland, and south; needlerush (Juncus roemerianus) dominant

Mid-Atlantic High Marsh (CEGL004197)

8
Narrow-leaved cattail abundant

Cattail Brackish Tidal Marsh (CEGL004201)

Eastern reed (Phragmites australis) dominated tidal marshes

9
Tidally influenced, dense tall grassland indicative of disturbance; occurs in a range of tidal wetland habitats
from fresh to brackish in salinity; scattered individuals of wax myrtle (Morella cerifera) shrubs possible.

Tidal Reed-grass Marsh (CEGL004187)

Stands occur in semipermanently flooded marshes, ditches, impoundments, etc. that have often been
disturbed by human activity; Phragmites australis invasive and exclusive with few to no other vascular
plants present

Eastern Reed Marsh (CEGL004141)

10
Maritime woodland that occurs on the upper edges of salt marshes dominated by eastern red cedar
(Juniperus virginiana)

Maritime Red-Cedar Woodland (CEGL006212)

Maritime shrubland; area between salt marsh and uplands

Mid-Atlantic Maritime Salt Shrub (CEGL003921)
NORTH ATLANTIC COASTAL PLAIN TIDAL SWAMP
CES203.282

- Freshwater Tidal Woodland CEGL006165
- North Atlantic Fresh Tidal Shrub Swamp CEGL006337
- Ash - Swamp Blackgum Freshwater Tidal Swamp CEGL006287

1
Tree canopy present........................................................................................................................................2

Shrub swamp is dominated by brook-side alder (*Alnus serrulata*) and/or speckled alder (*Alnus incana ssp. rugosa*)........................................................................................................................................

**North Atlantic Fresh Tidal Shrub Swamp** (CEGL006337)

2
Red maple (*Acer rubrum*) and green ash (*Fraxinus pennsylvanica*) dominate the canopy; elms (*Ulmus spp.*) frequent associates........................................................................................................................................

**Freshwater Tidal Woodland** (CEGL006165)

Canopy dominated by pumpkin ash (*Fraxinus profunda*), green ash and swamp black gum (*Nyssa biflora*); seaside alder (*Alnus maritima*) is characteristic in Delaware and Maryland........................................................................

**Ash - Swamp Blackgum Freshwater Tidal Swamp** (CEGL006287)